NOVEMBER 1941 Thirty-Five Cents Per Copy

Federal mine inspection is no longer a debatable issue. The law is on the books and the question now is how best to employ it to promote greater safety in the mines. This, however, is not simply a matter of Congressional enactment. There must be planning, organization and personnel. What is being done in these directions at Washington and elsewhere will be the subject of a Special Safety Section in December *Coal Age*. . . . **Job misfits,** as O. G. Van Campen emphasized last month, are costly and dangerous luxuries. Fitting the man to the job is the first step in increasing individual efficiency and maintaining operating performance standards. Many factors enter into scientific job placement. And not the least, he points out in the third article in his series, are the emotional characteristics and family environment of the workman. Turn to p. 45. . . . **Mechanical** mining and mechanical cleaning usually go hand in hand. So Consol supplements mechanical loading at its No. 32 mine with full-scale mechanical cleaning, screening and blending to please the most hypercritical buyer. Ivan Given tells the story of the equip-

(CONTINUED ON PAGE 7)

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Coal Age

Volume 46 Number 11

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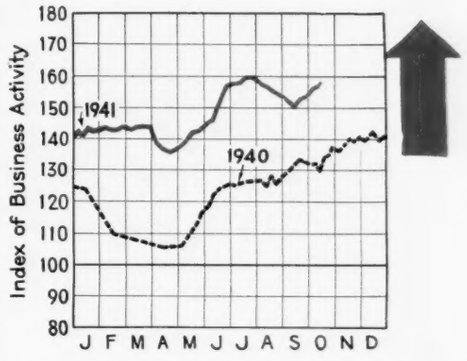
(CONTINUED FROM PAGE 5)

ment and operation of this new 450-tons-per-hour plant in the next issue. . . . **Stoker enthusiasts** sometimes brood over the failure of automatic coal heat to make a bigger dent in the new-home market. Not Don Baker. He wanted a stoker installation in his new Merion home that would take a back seat for no competitive heating —even if it meant doing his own basement planning. What he did, and how, are explained in the story appearing on p. 43. Must reading for every merchandising-minded coal operator. . . . **Mining** institute and other technical meetings head for their autumnal peak while *Coal Age* editors travel hither and yon to capture the high spots for the printed page. December will carry, among others, reports on the Springfield meeting of the Illinois Mining Institute and the Morgantown gathering of the West Virginia Mining Institute—with the Annual A.I.M.E. - A.S.M.E. Joint Fuels Conference and the Indiana Mining Institute in the offing. . . . **"Unfavorable** natural conditions" have long furnished a ready defense for management reluctant to abandon traditional methods. But an ever-growing list of progressive executives in all parts of the country continue boldly to challenge such traditions. Witness Clinton Block Coal Co. Working under the Pittsburgh drawslate, conveyor crews at Clinton mine average nearly 16 tons per man. Mining Engineer Bannister tells all about it on p. 57.

HOW'S BUSINESS

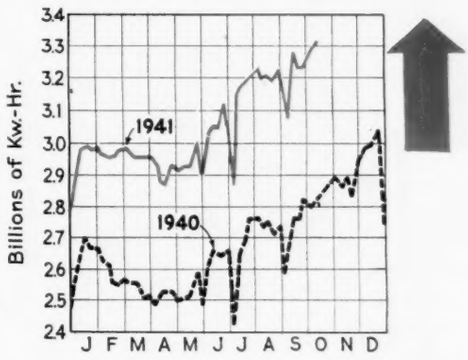
GENERAL BUSINESS CONDITIONS

After several months on a plateau business, according to *Business Week* of Oct. 18, has lost its defense-inspired resurgence. Instead of stimulating demand for consumer goods, expenditures for armament in some instances now tend to reduce it—witness restrictions on manufacture of some products. With subsidence of buying against a silk-stocking shortage and to beat new tax schedules, the ultimate consumer is expected to settle down to normal buying, letting consumption and purchases more or less balance. The Index was at 157.6, against 157.3 a week previous and 154.5 a month earlier.



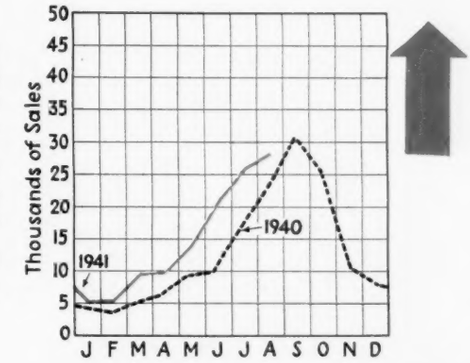
ELECTRICAL POWER OUTPUT

Production of energy by the electric light and power industry for the week ended Oct. 11, according to the Edison Electric Institute, established a new all-time peak at 3,314,952,000 kw.-hr., 17.7 per cent above the corresponding week a year ago. Output for other recent weeks was: Sept. 20, 3,232,000,000 kw.-hr.; Sept. 27, 3,233,000,000; Oct. 4, 3,290,000,000 kw.-hr.



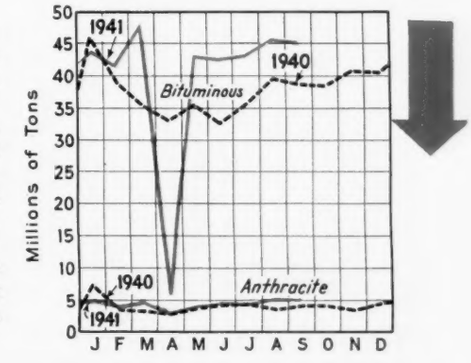
COAL STOKER SALES

Mechanical stoker sales in the United States in August last totaled 28,714 units (U. S. Bureau of the Census from 101 manufacturers), compared with 26,449 in the preceding month and 23,477 (revised) in August, 1940. Sales of small units in August last were: Class 1 (under 61 lb. of coal per hour), 26,366 (bituminous, 24,003; anthracite, 2,363); Class 2 (61-100 lb. per hour), 955 (bituminous, 890; anthracite, 65); Class 3 (101-300 lb. per hour), 906.



COAL PRODUCTION

Bituminous coal produced by United States coal mines in September last (preliminary) totaled 45,464,000 net tons, according to the Bituminous Coal Division, U. S. Department of the Interior. This compares with 45,650,000 tons in the preceding month and 38,650,000 tons in September, 1940. Anthracite tonnage in September last, according to the U. S. Bureau of Mines (preliminary), was 5,138,000, against 5,246,000 (revised) in the preceding month and 4,172,000 tons in September, 1940.



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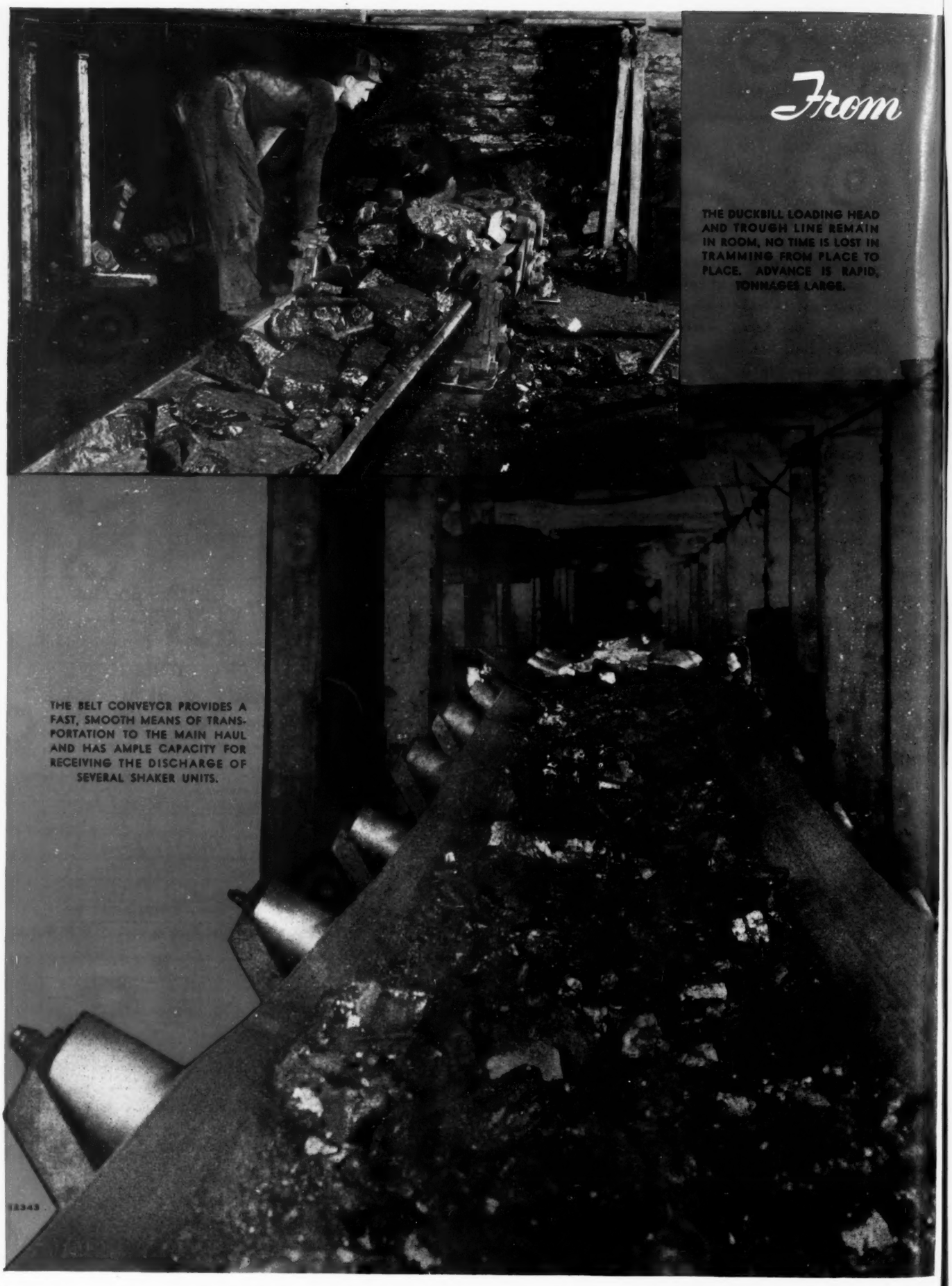

From
THE DUCKBILL LOADING HEAD AND TROUGH LINE REMAIN IN ROOM, NO TIME IS LOST IN TRAMMING FROM PLACE TO PLACE. ADVANCE IS RAPID, TONNAGES LARGE.
THE BELT CONVEYOR PROVIDES A FAST, SMOOTH MEANS OF TRANSPORTATION TO THE MAIN HAUL AND HAS AMPLE CAPACITY FOR RECEIVING THE DISCHARGE OF SEVERAL SHAKER UNITS.

DEVOTED TO THE OPERATING, TECHNICAL AND BUSINESS PROBLEMS OF THE COAL-MINING INDUSTRY

Coal Age

Established 1911 — McGraw-Hill Publishing Co., Inc.
SYDNEY A. HALE, Editor • NOVEMBER 1941

Pertinent and Impertinent

• CERTAIN labor leaders seem bent on demonstrating that every man can be the architect of his own misfortunes.

• WISECRACKING about captive miners is very tempting just now. But a strike imperiling the flow of steel for national defense during the current critical period is no joke.

• SECRETARY ICKES' now-exploded oil scarcity was nice while it lasted and doubtless made many consumers think twice about dependence on liquid fuel. Real merchandising-minded coal men, however, will seek to build firm markets upon something more secure than the possible early disappearance of a competitor.

• BASED on reports from 1,008 companies, the National Association of Manufacturers estimates that the manufacturing industry will spend $117,490,000, or 1.1 per cent of its gross sales, on research in 1941. Think what that percentage applied to the gross sales of the coal industry this year would mean! Now and for the future.

• STOKERS have made an astounding record on conversion-job sales. And, in case after case, installing automatic heat under a hand-fired furnace has prevented the householder from deserting solid fuel for gas or oil. But getting a stoker into new residences has not been as easy. Yet it can be done—particularly if the consumer is determined to enjoy the economies and conveniences of solid fuel. Don Baker, as shown in the story in this issue of *Coal Age*, proved that. The most significant aspect, however, was that he felt compelled to do his own basement designing and planning in order to have the kind of installation he wanted. Chew that one over when you're bewailing the inroads of competitive fuels in the domestic market.

• RECRUITING qualified personnel to handle the job of federal mine inspectors under the new law threatens to leave holes in the ranks of safety men now on the payrolls of State mining departments and operating companies. Already some companies have been forced to raise the ante to hold good men. Well, that's one way to make management keenly conscious of the value of safety.

• REMEMBER that famous Brookings Institute report on "America's Capacity to Produce"? With most of the major metals of the country under increasingly strict conservation and priority control, a re-reading of that volume ought to be stimulating.

• ACCIDENT hazards once thought decently interred too often have a nasty habit of reappearing in ghostly guise. Not so long ago many fondly believed that the advent of rock-dusting would toll the knell of coal-dust dangers. But so many new ills are now charged to it that the National Safety Council made a dust-allaying symposium the star feature of its mining section meeting last month. Eternal vigilance is still the price of safety.

• SUCCESS in stripping has been achieved largely by reason of the efficient maintenance and repair shops of the strippers. Deep-mine operators would do well to tear a leaf from the strippers' logbook. Clever ideas regarding mechanical operation date back to Leonardo da Vinci and Benjamin Franklin, but success in their application rests much in the efficiency of the machine shop that keeps the machines in fit shape.

• RAILROADS still far outstrip the mining industry in taking advantage of the economies in treated timber. Last year nearly 20 per cent more ties were treated than in 1939 and electric railroads doubled their use of such ties. Output of treated timber as a whole increased 8.26 per cent. Sometimes one wonders if replacement of main-line ties and crossbars in mines is not regarded as a pleasing pastime for idle tracklayers and timbermen.

• TALKING ABOUT high-speed quantity production of defense equipment, observes *Link-Belt News*, it is easy to forget that "no unit can be completed and ready for service until every needed part is on hand and ready for assembly. Little parts," it adds sententiously, "can slow down big production." How true, not only in the production of new machinery but also in keeping older equipment running!

What's Settled?

As THESE LINES are written, the battle between the President of the United States and the head of the United Mine Workers over the stoppage of work at the captive mines is too fluid for crystallized judgment. A temporary face-saving truce has been effected, but the terms give no assurance that the same issue may not cause another suspension of mining in a few weeks. How far the captive mines should go in "recognizing" the miners' union has been in dispute since the first Appalachian wage agreement was negotiated in 1933. The published terms of the truce of Oct. 29 still leave that question in the air, since there has been no binding agreement to abide by the recommendations of the National Defense Mediation Board.

One thing, however, is fairly obvious. The country at large is fed up with labor disturbances interfering with the production of goods essential to the national-defense program. With a "shooting war" now an actuality, the temper of the people as a whole will not be too tolerant of actions which jeopardize that program or too nice, perhaps, in its assessment of blame. Today organized labor occupies a position of national dominance never before approached in our time. It would be ironic to see it lose that position because of its leadership.

Wage Ceilings

CEILINGS on wages, prices or profits—except as established by the interplay of competitive business—are inherently incompatible with free industrial enterprise. They are endurable only in an emergency and emotionally acceptable only when imposed on the other fellow, and sometimes not even then. Once the imposition is started on one factor, however, the very interplay makes it difficult to isolate a single link in a causative chain.

Canada has frankly recognized this difficulty by extending Dominion price control over all commodity prices and wages. In the United States, administration spokesmen cry for statutory price control, but fight shy of governmental regulation of wages.

The step with respect to wages is an extension of a policy first adopted late in 1940 when changes in wage rates in Canadian war industries were tied to changes in the cost of living. Mine workers in the Western Provinces months ago accepted this system with its machinery for periodic reexamination of living costs and, if justified, the addition of cost-of-living bonuses to basic wage rates.

During the 1941 Appalachian wage negotiations, there were a few faint suggestions that the Canadian cost-of-living adjustment might be a good thing on this side of the border. No serious consideration apparently was given the proposal by the scale committee. The Canadian decision again brings the question to the foreground—not only in coal mining but in every industry. And some organized labor groups working in war industries seem to be making Congress less squeamish about denying labor preferential treatment over the rest of the citizens of the land.

Plan Now—and Wisely

FINANCIALLY the situation in the bituminous coal-mining industry is healthier than it has been for many years. Rising demand and a stabilized price structure have materially improved gross realizations. Cost reductions, influenced in part by steadier running time but fundamentally attributable to the continued spread of mechanized mining have increased net margins. Higher basic wage rates imposed on the industry by a powerful labor organization have been measurably offset by the increased efficiency in operating methods and equipment.

How long and how far this offsetting process can go on is speculative. Patently there must be some point in the process when increased costs, irrespective of their source, must be directly reflected in the price the consumer is asked to pay for the product. But to assume that management and manufacturer already have exhausted the possibilities for still lower-cost production would be to underrate the abilities of both groups. Some of the reductions effected in the last few years would have seemed incredible to an older generation of operating men; there is no warrant for believing the end has been reached.

Progressive management will utilize the breathing spell the more favorable position of the industry affords to plan future improvements. Projects essentially sound and desirable but theretofore postponed because of financial considerations can be reexamined. Money ploughed back into betterments and promotional developments while funds are more readily available mean company insurance against the day when a post-war competition more bitter than any yet experienced will lay low the inefficient and the unprepared.

Grudges Are Costly

EVER SINCE Northern and Southern Appalachian operators parted company last spring over the wage differential, rumors have been persistent that the Southern group would sooner or later signalize its dissatisfaction by withdrawing from the National Coal Association. In the heat of controversy such feelings were understandable. Tempers had been strained to the breaking point and a disposition to strike blindly at those the contestants thought had not given the utmost support to their particular side was not surprising. But a revival of such rumors at this time is, to say the least, disquieting.

If there is any foundation for such reports, their existence is hardly a tribute to statesmanship and constructive thinking in the industry. The sober truth of the situation is that neither section of the Appalachian region is big enough to face the problems of the coming months and years alone. Together they have a chance—and an opportunity—to rebuild the industry for greater things. Divided, they inevitably will be the victims of internal dissensions and the prey of outside competitive forces. Is such a course worth the price?

"NEW HOME" BOGEY

Licked by Stoker Installation Matching Rival Automatic Heat—at Less Cost

DOMESTIC stokers continue to hang up new sales records as the months roll by. This youthful industry has become one of the wonder boys of the age. The only blot on an otherwise cheerful picture is that most of the installations represent simply replacements of hand-fired coal-burning units.

When it comes to heating equipment for new homes, the record has been less inspiring. Some gains, it is true, have been made—chiefly through the activities of Anthracite Industries, Inc., and the National Coal Association. By and large, however, oil and gas have had the edge in the new-home market.

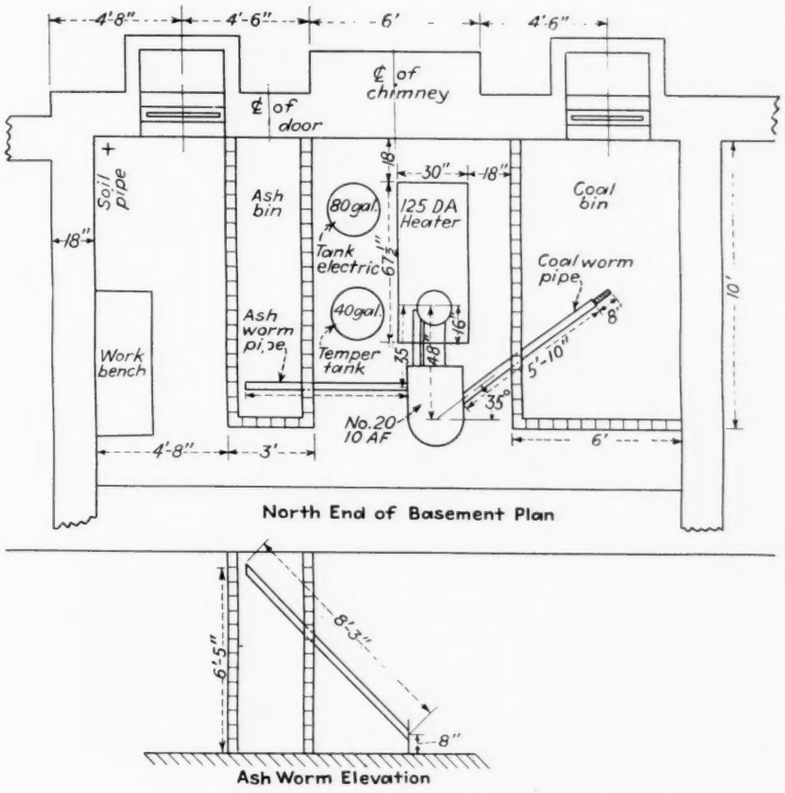
But that edge is threatened by the initiative of a determined householder. Earlier this year, Donald J. Baker, assistant sales manager, I-T-E Circuit Breaker Co., decided to build a new home in Merion, one of the choice suburban sections of Philadelphia. Mr. Baker wanted the economic advantages of coal with all the conveniences of automatic heat. And he got them!

The arrangements for coal heat are fully automatic and demonstrate what can be accomplished today for the builder of a new home in eliminating every objection that has ever been raised against burning coal. Advantages over oil-burner installations are many.

As shown in the accompanying sketch, it will be noted one corner of the basement has been used for a coal bin, serviced from a window in the foundation wall. The bin, built as a hopper with sloping sides and feeding centerward, is constructed of concrete block up to the first-floor joists and cement plastered on the basement sides. All seams and joints around the ceiling and sides are calked on the inside, making the bin entirely dustproof. One of the warm-air ducts passes overhead and keeps the bin and contents warm and dry.

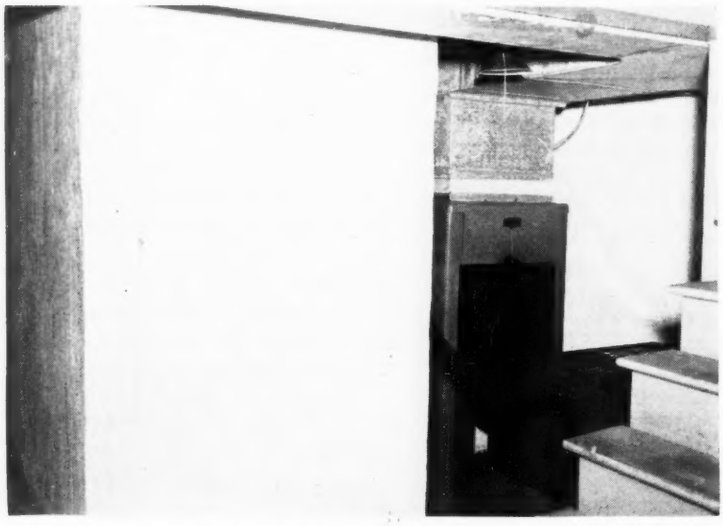
A cast-iron pipe containing the stoker-coal worm is set in one bin wall 8 in. off the floor and forms the only connection between basement and bin. This worm extends from the center of the coal bin to a No. 20-10AF Motor Stoker installed in front of a No. 125 DA Fitzgibbons circulating hot-air heater with automatic humidifier and air filters.

Stoker operation is governed from a thermostat located in the dining room above. The control includes a timing relay for starting up the stoker for two-minute periods every half hour to maintain the fire in the retort. Two thermal relays in the heater bonnet prevent circulation of air in the ducts if the furnace is not up to temperature,

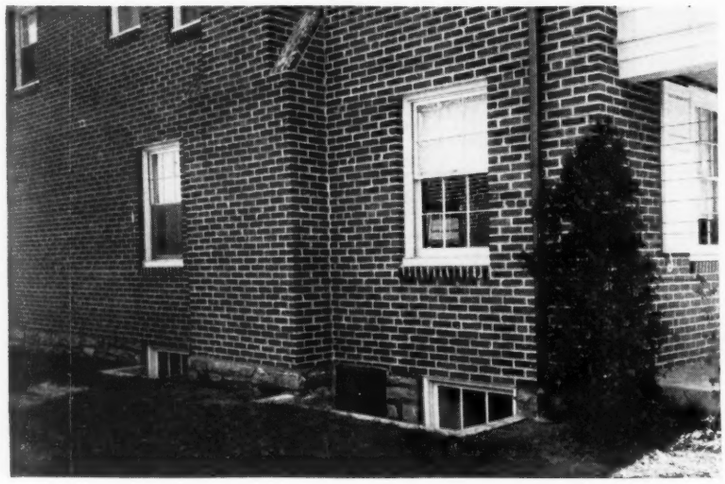


Basement Layout for new-home stoker installation.

Coal stoker and furnace with coal-bin wall at right.



Coal stoker and furnace with ash bin at left.



Coal-bin window at extreme lower left and cast-iron door to ash bin.

or shut down the stoker if the bonnet temperature should become excessive. A time clock opens the main thermostat circuit at a predetermined time at night and closes it in the morning. During this interval the fire in the retort is kept alive from the half-hourly operating periods mentioned.

Ash disposal is from another worm over an ash bin. This bin is of the same construction as the coal bin, caulked on the inside and having a galvanized sheet steel top. It is 3 ft. wide and has sufficient capacity to store the ashes for two seasons' operation if desired. It is serviced from a cast-iron door set in the foundation wall adjacent to another of the basement windows. The ashes may be removed in the summer in three or four hours after dampening previously.

The installation is in a section of the Philadelphia suburbs where gas is not available and hot water is obtained from an electric heater. A cast-brass coil in the furnace preheats the water in another tank in series with the electric heater, thus taking considerable load off the electric and insuring a uniform and adequate supply of hot water at all times. In the summer when the stoker is not running, the hot water supply is, of course, from the electric heater entirely.

Cost and Storage Assuring

Fuel costs for this type of installation compared to nearby oil-burner-equipped homes of similar size proved to be approximately two-thirds of the latter. A full season's supply of fuel can be stored in the bin, whereas the average oil-burner application employs a storage tank with only enough capacity for two to three weeks of cold weather. This is a decided advantage today when there is so much talk of oil scarcity and rising prices.

Anthracite heat, once divorced from the dust and dirt incidental to the handling of coal and ash, as in this instance, is just as clean as or cleaner than oil-burner heat where an oily film difficult to eliminate often forms on furniture and fixings.

The suburban home owner probably will want to save his ashes after sifting and keep the fines for lawn and flower-bed usage. Ash as a fertilizer has both good mineral content and the ability to make soil better adapted for holding moisture.

Initial costs of the complete equipment are slightly higher than an oil-burner installation, but these would be offset by lower maintenance over a period of four or five years.

THIRD OF A SERIES OF ARTICLES
ON HUMAN RELATIONS AND PERSONNEL BUILDING
IN THE COAL-MINING INDUSTRY

INCREASED EFFICIENCY

And High Performance Standards Definitely Linked to Fitting Workman to Job

Fitting the worker to the job means matching the physical and emotional make-up, the personality traits and innate capacities and skills of a human being to the exact specifications and requirements of a definite kind of work. This can be done only by analyzing how the man will influence the work and what the job will do to the man. A man is in the right job when he can maintain standard performance with a minimum expenditure of energy and effort.

By O. G. VAN CAMPEN
Consultant, Industrial Relations

FITTING the worker to the job represents the first and, perhaps, the most important step in increasing individual efficiency and maintaining standard performance. It also represents a fundamental responsibility of management. The harmful effect of misplacement in a job cannot be overemphasized.

Serious emotional disturbances, needless fatigue that undermines health, and the constant irritations that bring about serious nerve strain are often the result when a worker attempts to continue on a job for which he is not fitted. These effects are displayed not only in the performance on the job—in contacts with his fellow workers and supervisors—but they are carried into the home. When carried into the home, they frequently result in conflicts between husband and wife and in serious misunderstandings between father and children. It has been definitely established that a worker who suffers from disturbances in his home and social life is an accident-prone worker—a hazard in the mine.

Every "job misfit" shows up on the cost sheet. The interruption in the flow of coal from the face that blocks the efforts of management to attain low cost production can be traced invariably to some form of "man inefficiency." The quantity of "dirty coal" at the tipple or cleaning plant indicates clearly how well the man in the mine is fitted to do the work to which he has been assigned. And the high cost of preventable accidents offers striking evidence of what the "job misfits" can do to production costs.

Fitting the worker to the job implies that an effort is being made to fit the physical make-up, the personality traits, and the innate capacities and skills of a human being into the exact specifications and requirements of a definite kind of work or job. It means analyzing how the man will influence the work, and what the job will do to the man. Fitting the man to the job actually means the weaving together of both into a total unit that will result in satisfactory performance with a minimum of wear and tear to both the job and the man.

As stated in a previous article, accurate selection must be predicated upon a thorough study of occupational activities and requirements—accurate job analysis. No man responsible for placing men in jobs can hope to make a proper selection without a thorough knowledge of the details of the job and the working conditions surrounding it because upon this knowledge depends the proper appreciation and accurate evaluation of the human capacities and skills required in the job.

The production manager of a large operating organization once remarked, as we stood watching an operator handle a loading machine: "We all have some ideas about these things called intelligence, muscular coordination, and mechanical ability, but we just haven't connected them up with doing a job. Somehow as you stand here watching that fellow handle those levers and move that machine into the coal you get a new slant on the human element in a job."

When the movements of a machine operator or any other worker are keenly observed as he works on the job the level of intelligence, the quality of muscular coordination, and the degree of mechanical ability become significant. Each job, with its surrounding working conditions, calls for a specific quality or quantity of human capacities, human aptitudes, and human abilities. Out of job specifications is created the yardstick by which a human being is measured. This yardstick sets up, in scale values, the man-qualifications necessary if the human being is to fit satisfactorily into the job.

When the analysis of a job is made it must not be approached from the standpoint of the worker doing the job. In most cases, a man does a job without realizing the details of how he does it. Such factors as keen observation, accuracy, good judgment and skill do not come within the attention—the conscious thinking—of the worker as he does his work.

A "trouble shooter" in one of the

shops was once asked to write down on paper an analysis of his work. Within a day or two he handed in one sheet of paper on which was, in his opinion, a very good description of his job. The observer, after having looked it over, began to ask questions that directed the thinking of the worker toward a detailed break-down of some of the main elements which the worker had listed. In a very few moments the man began to see in a new light the actual details of analysis, deduction, judgment, and accuracy involved in his work, and he himself asked the observer to let him submit another analysis of his job. When he sent it in, after a week of careful thinking, the analysis covered ten pages.

A job must be analyzed from the approach of an instructor whose business it is to teach a man how to perform in the job. This approach is quite similar to that of motion and time study in which elements within the operation or task are specifically noted and evaluated. The establishment of such elements makes it possible to recognize the human factors involved in a job and the degree of these factors necessary to satisfactory performance. When so related, human attributes lose some of their mystery. They become less intangible and of more practical value to the employment manager, the superintendent, and the foreman.

How Men May Be Judged

In coal mining the following factors should govern the selection and placement of men:

Mental Factors: Intelligence, keenness and alertness, accurate observation, high visual ability, sound judgment, accuracy, ability to think creatively — resourcefulness, analytical ability.

Physical Factors: Good health and reserve energy, high degree of muscular coordination and action, body skill —hand dexterity, high energy "output," height, weight, size of foot, etc.

Emotional Factors: Emotional balance—stability, emotional control, enthusiasm—love of action, wholesome attitude toward home, work and authority, "will to get things done," constructive acceptance of criticism, capacity to cope with emergencies.

Character Factors: Ingrained sense of ethical values, high personal standards, strong sense of personal responsibility, pride in workmanship; consistent, wholesome personal habits.

As the result of continued progress in scientific selection more attention is being given to the temperament or emotional make-up of the individual. Human emotions exert a powerful influence for good or ill over the capacities and abilities of workers. The quality and character of the relationships in the home are being more carefully analyzed since the emotional tendencies expressed in the behavior in the home definitely affect the emotional habits on the job.

The relation of the emotional make-up to individual attitudes is receiving particular attention. It is being recognized that the emotional tendencies of an individual definitely influence attitudes in the group relationships in the work situation and in the relationship of the worker to supervision. Workers are governed not by what they think but by how they feel. The emotional make-up of men must be more thoroughly understood if it is to be handled effectively in connection with a job.

Emotional Imbalance

Anyone who has been responsible for the handling of grievances has become fully aware of the difficulties encountered when dealing with men whose emotions are out of control. They know also from experience how wrong attitudes block their efforts toward a satisfactory solution of grievance problems. It is the emotionally unbalanced—the emotionally immature—men that are the "big headaches" to superintendents and mine foremen. One discontented, maladjusted worker can throw an entire section "haywire." Faulty selection in the past is the real cause of the labor troubles in coal mines today.

In order to determine whether a new employee, or a worker within the organization selected for promotion, has the required qualifications for a given job, methods of testing must be developed. Job analysis will definitely indicate the best procedures for testing such factors as mental alertness—muscular coordination, hand dexterity, etc. Sometimes the machine itself or a fundamental part of the machine is used as a testing medium. In other cases the work situation is set up in miniature while still other methods make use of mechanical devices that will enable the workers to perform in a manner that will cover the important elements in the job.

There are many tests available which determine and evaluate the intelligence level, emotional tendencies, mechanical aptitudes, learning ability, and other trait groups of the individual. The material contained in these tests can be readily adapted to the coal industry under wise direction.

When properly conducted, the interview provides an excellent opportunity to discover and evaluate the attitudes of an individual. By means of wisely directed questions the employment manager, the personnel man, or the superintendent can determine quite definitely whether a man is combative, sullen, or moody; whether he is fearful and evasive or whether he is ambitious, cheerful and enthusiastic. The interview also provides the medium through which the quality and extent of the worker's educational background and experience can be evaluated.

Many writers on industrial relations regard the interview as having little value in selecting employees. This is because the average interview lacks direction and objective. The average interviewer is not trained. He wanders "all over the lot." He does not know what it is he is trying to discover—and the interview is little more than a barrage of words. To be productive, an interview should be predicated upon the factors derived from job specifications and man qualifications. An interview technique should be developed that will bring to light, quickly and definitely, whether or not an employee has the qualifications required to fill the job under discussion. Under the direction of a well-trained man the interview can be a valuable aid in selecting and placing men.

Test Human Material

Industry in general and the coal industry in particular have a great deal to learn about what the scientifically selected and thoroughly trained man can do to quality and low-cost production. One operating company is just beginning to find out. In one of its mines the superintendent, general mine foreman and most of the assistant mine foremen fit very well into the jobs they hold. The spirit of the working force in this mine for the most part is excellent. The cooperation among the supervisors and between supervisors and workers is above average. Top management in this company has been just a little bit amazed at what this mine is doing to accident prevention and lowered costs.

Fitting the right man to the right job is not a wild Utopian idea even though it may appear a bit radical to the "old timers." It is an idea that is full of dynamite, and it represents one of the powerful factors that will be felt definitely in the new "struggle for survival" in the coal industry "that is just around the corner."

CENTRIFUGAL DRYER

Recovering 10-Mesh Slurry Carbon Tucked Into Plant Without An Addition

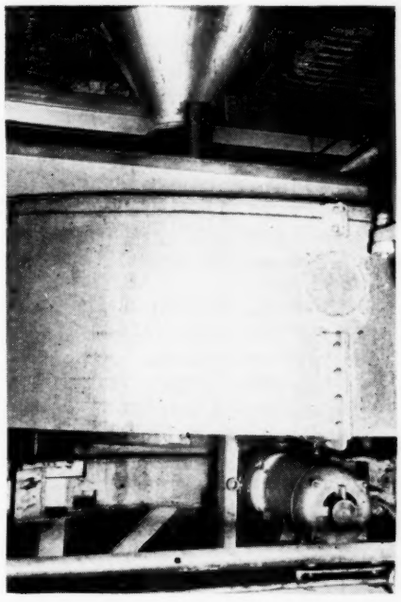
By J. H. EDWARDS
Associate Editor, Coal Age

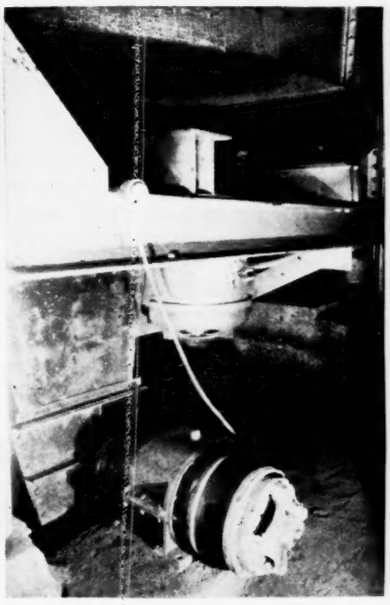
WITHOUT adding to its preparation-plant building the Sentry Coal Mining Co., Madisonville, Ky., has installed drying equipment which is recovering the minus-10-mesh carbon from slurry at the rate of 20 to 25 tons per hour. This is done with a continuous centrifugal dryer which reduces the surface moisture from 30 per cent to 5 per cent.

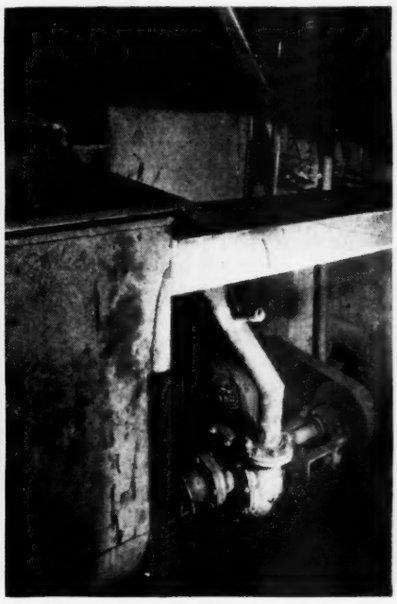
Sentry cleaning plant, built in 1937 and containing McNally-Norton washers, prepares 4,000 tons of "Sentry No. 14 Coal" and "Stray Seam Coal" per day from the company's strip pits. It is a Sinclair interest, of which Grant Stauffer is president, L. Russel Kelce, vice president, and Merle C. Kelce, general superintendent. C. E. Mattox is superintendent and E. E. Price in charge of preparation at Sentry.

The dryer which has a 48-in. cone screen basket and was made by the Centrifugal & Mechanical Industries, Inc., St. Louis, is installed on ground-level foundations in a part of the plant adjacent to the heating boiler and pump room. A hole was cut in the concrete floor above the center of the dryer to accommodate the feed hopper. Fines from the dewatering and rinsing screens constitute the slurry feed to the dryer. Formerly these were wasted from the settling cone.

Four motors totaling 88 connected-horsepower were added to the plant to power the dryer and auxiliaries. A slow-speed McNally effluent pump is driven through V-belts from a 20-hp. 1,160-r.p.m. motor. A screw conveyor which moves the dried slurry to an elevator is driven by a 10-hp. gear motor. Main and auxiliary drives of the dryer are 60- and 5-hp. motors. Voltage is 440 and all four of the motors are Westinghouse make.







Left—Side view of dryer showing 5-hp. auxiliary motor. A hole was cut through the concrete second floor to accommodate conical feed hopper. Center—Ground view of dryer. In foreground is gear motor driving screw conveyor and just above it and farther back is 60-hp. vertical motor of dryer. Right—Effluent pump working in connection with dryer.

[FIRST OF A SERIES OF THREE ARTICLES ON ORIGIN AND MEANING OF POWER FACTOR]

POWER FACTOR

Not the Mysterious Subject Many Think; Something Every Mine Electrician Should Know

By FRED W. RICHART
Editorial Staff, Coal Age

THE SUBJECT of power factor is still a puzzling one to many mining men. It is a good deal like higher mathematics to most of us. We are scared before we start. Take courage; the practical side of the whole question is to know where it happens and what to do about it. The average mine electrician can easily learn that. It is quite simple.

As far back as the February, 1928, *Coal Age*, J. H. Edwards quoted a modern fable about a team of horses named Volt and Ampere. When they seesawed, the wagon did not move; no work was done. Their effort was out of phase and the power factor was zero. But when the driver tightened the reins, got them in step, or in phase, and cracked the whip, they pulled the load easily. The power factor was then 100 per cent.

Another device to make the conception of power factor visible to the eye is the beer glass half filled with foam—foam that has no kick. The foam requires space but does no work. This analogy is hardly as good as the balky team, but it illustrates one phase of bad power factor: the increased conductor capacity necessary to carry the excess current.

Most engineers are guilty of talking about power factor as if it were a *condition* that does nothing but make trouble. Power factor is not a condition; it is the result of a condition. The condition that brings power factor to life is the fact that current is almost never in phase with volts. Relative to volts, current is almost always shifting—seesawing. Take a look at the power-factor meter on your switchboard; it is not still for long at a time.

Let us first learn what a factor is. Webster says, "A factor is any one of the quantities which, multiplied together, form a product." You learned from arithmetic that 2 and 3 are factors of 6; that is, $2 \times 3 = 6$. Therefore, *power* factor is one of the three factors which, multiplied together, indicate electric power. The other two factors are volts and amperes. So then, power = volts × amperes × power factor = watts. So we have learned that power factor is merely a plain figure or number. But, let us add, its value may be anything from zero to unity. Unity (or 1) power factor is exactly the same as 100 per cent power factor. More will be said about the varying value of power factor, later.

Now let us put power factor on paper, or in the shape of a formula. We have already learned that volts × amperes × power factor equals watts. Since current is almost always lagging, or leading, we must take power factor into account in all our dealings with alternating current. Take the equation above—volts × amperes × power factor = watts. Let's do a little arithmetic, or algebra, if you prefer to call it that. Divide by volts × amperes. We have

$$\frac{\text{volts} \times \text{amperes} \times \text{power factor}}{\text{volts} \times \text{amperes}} = \frac{\text{watts}}{\text{volts} \times \text{amperes}}$$

Because we have volts × amperes both above and below the line in the first term of the equation, they cancel out. We have left power factor = $\frac{\text{watts}}{\text{volts} \times \text{amperes}}$, which is our formula. Put it in words. Power factor is equal to watts divided by volts times amperes.

Now, let us be sure we understand three commonly used and important terms—terms that are used to define and measure power factor. They are kilowatt, kilovolt-ampere and reactive kilovolt-ampere, designated as "kw.," "kva." and "rkva." The watt is too small in value for convenience. It would be like counting money by tenths of a cent instead of by dollars. So we multiply the watt by 1,000 and call it kilowatt, equals 1,000 watts, designated by "kw." In like manner, the kilovolt-ampere equals 1,000 volt-amperes, is indicated by "kva." The other term, "rkva.," is read "reactive kva." It represents the magnetizing current of the circuit, and lags exactly 90 deg. behind useful current.

Now we may change the form of our elementary formula,

power factor = $\frac{\text{watts}}{\text{volt-amperes}}$, to this form: power factor = $\frac{\text{kw.}}{\text{kva.}}$. All we have done is to substitute the standard, everyday terms kw. and kva. for watts and volt-amperes.

Here is what power factor is: the measurement of the lag of current behind voltage, or the lead of current ahead of voltage. The power-factor meter on your switchboard is not graduated in degrees, as you might expect, but in the relationship kw. divided by kva. $\left(\frac{\text{kw.}}{\text{kva.}}\right)$, a much more convenient arrangement for practical use.

There are two ways to obtain the

true power in an a.c. power circuit:

1. Multiply volt-ampere readings by power factor.

2. Read directly off the wattmeter or count the rotations of the watthour meter for a definite length of time.

Because motors, control, transformers and other magnetic devices set up disturbances which throw current flow out of phase with impressed voltage, there results the relationship called power factor. It is a relationship or ratio expressed in plain figures. With varying loads on the system, the power factor never stays constant any more than do amperes. It is always shifting with changes of load and switching of equipment.

The impressed voltage in an a.c. circuit usually is represented by a sine curve, which is derived by plotting potential against time. Fig. 1 is such a curve, showing peak voltage at *A*, zero voltage at *B*, the lower half of the curve indicating reverse polarity and the dotted line *CD* representing effective voltage, which is what the voltmeter indicates.

The standard frequency in this country is 60 cycles per second, although there are a few power systems using odd frequencies, as 25 or 40 cycles. The time required to complete one cycle is 1/60 second, which is represented by the completion of one loop above and one loop below the center line, Fig. 1. The operating time of switching equipment frequently is stated in cycles, so that 6 cycles means 1/10 second.

Power Factor a Result

Suppose we look at Figs. 2 and 3, and try to visualize this disturbance which we so often, falsely, call power factor. This disturbance is not power factor; merely its daddy. Look at Fig. 2. The peaks and zero points of voltage and current curves occur simultaneously, therefore volt and ammeter readings represent true power. The circuit has 100 per cent power factor. Kw. and kva. are identical in value. Consider Fig. 3. It will be noted that current lags behind voltage. At the point *A*, of maximum voltage, the amperes are increasing but the peak has not been reached. So, the product of current and voltage at that point is less than at *A* of Fig. 2. When we average all the products up, we find power totals less than when current was in phase with voltage. Therefore, effective volts times effective amperes is not true power. It is too much. It must be multiplied by some factor, depending on the degrees current lags behind voltage. Power factor is that multiplier or factor.

To repeat: Power factor is the relation of kw. to kva. and is defined as $\frac{\text{kw.}}{\text{kva.}}$ (kw. divided by kva.). It can never be greater than unity, or 100 per cent, for kw. can never be more than kva. Let us add now that for practical purposes it can never reach the zero point. Every electrical device requires some energy, that magnetizing current may flow.

Please note this: Current (power factor) may be lagging, the usual condition; or it may be leading, the rare condition. In either case it is equally disturbing to generating equipment, power lines and substations. Leading current is indicated by reverse movement of the indicating hand of a power-factor meter, or by the reverse rotation of the rkva.-hour meter. It is customary for power companies to add a ratchet to rkva.-hour meters to keep them from rotating backward. In other words, they refuse to credit customers with leading power factor, although it helps their operating condition, for total load always is lagging.

Practically all power-factor problems may be illustrated by a right-angled triangle, Fig. 4, in which *AC* represents actual current, *AB* useful, or power, current, and *BC* magnetizing, or reactive, current. The same diagram may be used equally well to represent power. In that case *AB* is kw., *AC* is kva. and *BC* is rkva. The greater the angle of lag, *BAC*, the

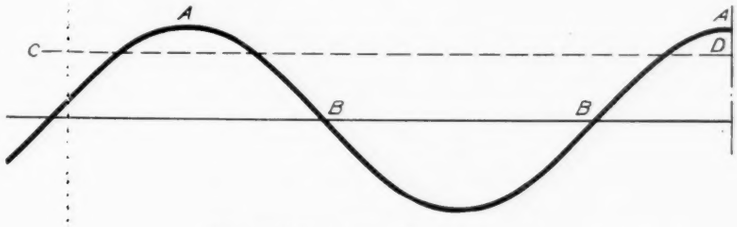


Fig. 1—Voltage curve for a.c. circuit.

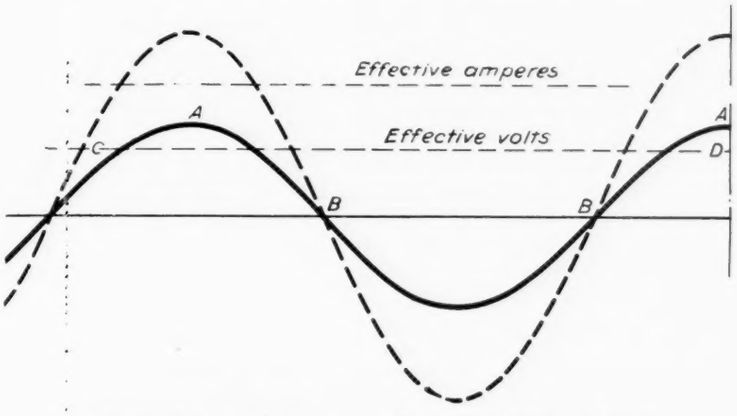


Fig. 2—Voltage and current conditions for unity power factor.

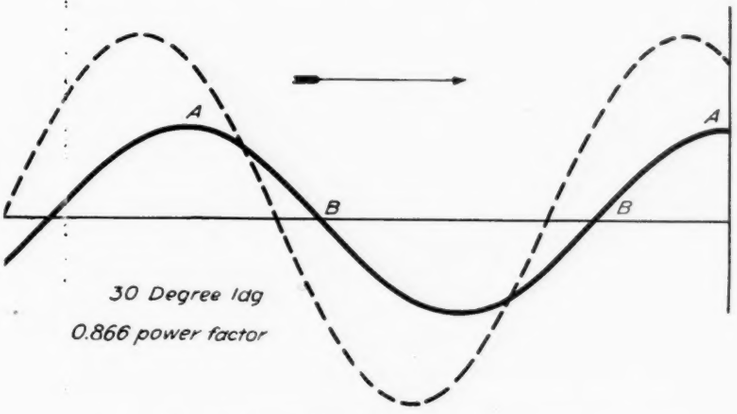


Fig. 3—Showing lagging current in a.c. circuit.

lower the power factor. This diagram is convenient for the graphical solution of power-factor problems, and to get a visual impression of what any definite power factor may mean. Fig. 4 represents 80 per cent power factor, the relative lengths of the sides being 5, 4 and 3. Power factor = $\frac{4}{5}$ = 0.80 or 80 per cent.

Normally, *BC*, the reactive kva., is said to be useless current—froth—which has to be provided for in generators, power lines and transformers, yet produces no results. It is true it does not produce power, but it has an important job to perform. It is called magnetizing current. It lags behind power current 90 deg.—exactly. For reasons that will appear later, we lay out this diagram so rkva. does lag exactly 90 deg. It is an artificial set-up to accommodate our calculations to the behavior of capacitors. It is an artificial arrangement made for convenience; useful and truthful.

As previously intimated, every piece of equipment containing a coil of wire and operating on a.c. circuits has certain definite, inherent power-factor characteristics which it impresses on the system. That influence extends back to the power plant. That value will not change so long as voltage, frequency or loads do not change. But it will change with a change of either. Consider a 100-hp. 1,200-r.p.m. 440-volt 3-phase 60-cycle squirrel-cage motor. Fully loaded, it will have a power factor approximately 0.90 lagging. Half loaded, the power factor will drop to 0.77 lagging. If, by any chance, this should be the only load on the system, omitting power line and transformer effect, the power factor of the system will be 0.90 or 0.77 lagging, depending on the motor load.

The cause of bad power factor is built into the machine. To a degree, it is under the control of the designer. But he must produce a machine of balanced essentials and reasonable

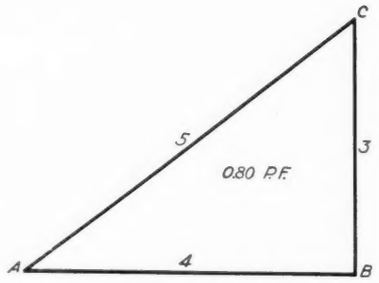


Fig. 4—Graphic statement of a power-factor problem.

Fig. 5—Illustrating poor power factor with lightly loaded motors.

cost. Improvement in certain characteristics must, sometimes, be made; usually at the price of other details equally desirable. The synchronous motor is the only type of device over which we have any control of the power factor. That is because it is separately excited, and the excitation may be varied at will.

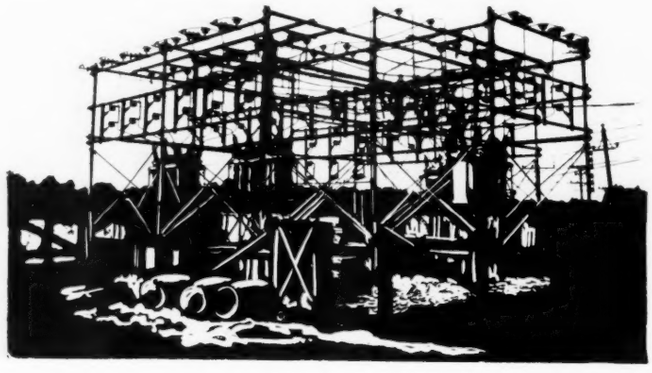
Let us consider the squirrel-cage motor again. It must get its excitation from somewhere. That can come only from current in the stator windings. It takes a 90-deg. lagging current to furnish that excitation. Whether you like it or not, the motor appropriates that lagging current. That is exactly what upsets conditions and produces lagging power factor. That is what becomes of the reactive kva., which we call useless and without which our simple squirrel-cage motors would not operate.

To say that rkva. current lags 90 deg. is, in a sense, misleading. Referring to Fig. 4, the actual current in the line is *AC* and not *AB* plus *BC*. Nevertheless, reactive kva. is equivalent to *BC*, for we must apply that amount of 90-deg. leading current to counteract it. This measure of the value of rkva. will be much better understood when we get to the point of discussing the capacitor as a means of power-factor correction.

One more point. Fig. 5 indicates the reason why motors running with no load, or lightly loaded, have such very poor power factor. The magnetizing current (rkva.) must remain at practically full-load value while the power current has only to provide for friction and windage losses. Since *AB* is very short compared to *AC*, it is apparent the power factor is low; perhaps 10 per cent or less.

It will be noted that all the figures, diagrams and much of the discussion referred to one single-phase circuit, except where the terms kw., kva. and rkva. were used. These diagrams and discussions apply equally well to 3-phase circuits. All that needs to be done to convert single-phase ampere readings to the equivalent of 3-phase amperes is to multiply by 1.73. That presupposes a balanced load on the 3-phase circuit. The 3-phase circuit is only a series of three single-phase circuits linked together.

The next section will be concerned with devices used for power-factor correction and with curves to aid calculations.



TEXAS LIGNITE MINE

Develops Method of Briquetting

In Struggle for Markets Vs. Gas and Oil

PIONEERING briquetting in Texas, the Consumers Lignite Co., Alba, began experiments in 1937. In October, 1938, plant construction began and after over a year of experimenting, based on scientific study and practical adjustments by trial and error, a successful briquet was obtained late in 1940, production of which was some 3,000 tons. Capacity now is 3.7 tons, or 592,000 briquets, per hour.

Surrounded by a cheap fuel market of gas and oil which had orphaned lignite as a fuel, the company turned to briquetting as a salvation. The problem was one of cost or there would be no market, so the method had to be economical. Successful procedure is based on heat, mix and ingredients, and one of the changes was to a fast cooling asphalt.

The briquets are pillow-shaped $1\frac{3}{8}$ x2x$2\frac{1}{2}$ in. and weigh 2 oz. each. They have 400-lb.-per-square-inch spring test, do not swell when burning and, as shown by a year of open storage, do not slack. They are not fragile and store without breaking. The only smoke while burning is at time of ignition, after which they resemble an anthracite fire bed.

Trade name is "Old King Koal Briquets" and domestic sales predominate, with commercial business anticipated as the product becomes known. Shipments are by the Texas Short Line of the Texas & Pacific and the Missouri, Kansas & Texas railways. Truck loading is available.

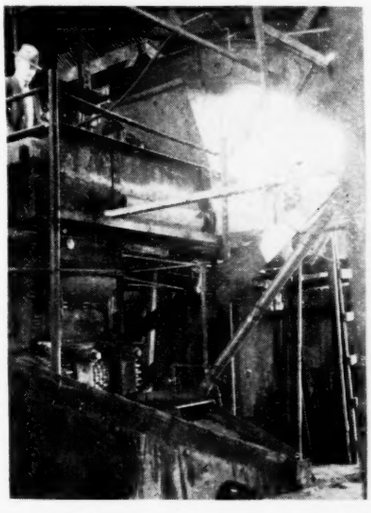
Raw lignite is dumped from mine cars into an 18x24-in. double-roll crusher and broken to ¼ in. and stored by a 10-in. screw conveyor in a 250-ton steel bin. A 6-in. bucket elevator from the bin feeds a 6x40-ft. rotary dryer which reduces moisture from 29.9 to 5 per cent. The dried product enters a Komareck-Greaves briquetting machine, where the lignite is pulverized to 30-40 mesh and then mixed with 10 per cent asphalt and binder. The cycle through this machine is one hour and ten minutes. Briquets are water-sprayed as they emerge and pass by a 2-ft.-wide 64-ft. long cooling conveyor into railroad cars or a 100-ton open storage space.

Originally eight men were required to operate the plant but now it is semi-automatic and only four are needed, which include a mine-car dumper and crusher attendant, briquet-machine operator, firemen and a foreman.

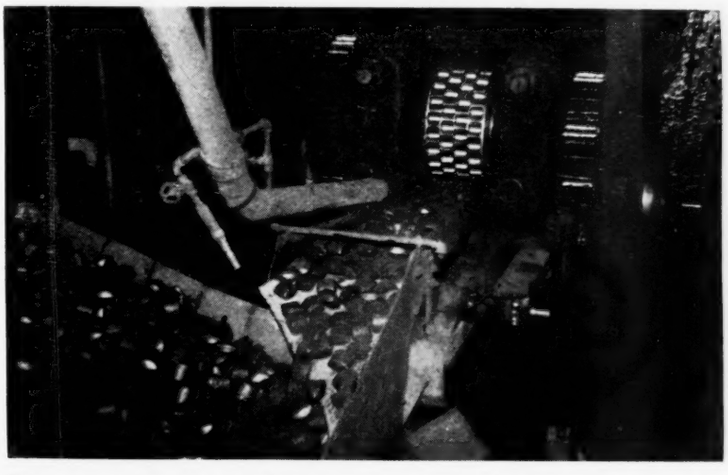
Asphalt is stored in a 16,000-gal. tank and all equipment except the briquet machine was rebuilt and designed at the mine. All power is from steam. Total cost, including construction, was $40,000 and briquets are made to sell at $4.50 per ton at retail; wholesale, proportionally lower —all f.o.b. plant. Production is planned for summer as well as during winter periods.

	Lignite	Briquet
Moisture	34.8	8.80
Volatile and Combustible Matter	28.10	42.37
Fixed Carbon	28.17	36.14
Ash	8.29	11.49
Sulphur	0.64	1.20
B.t.u.	7,008	11,536

Comparative analysis on as-received basis.



General view of the briquetting machine which receives dried minus ¼-in. lignite (5 per cent moisture), pulverizes to 30-40 mesh, and adds asphalt and binder.



Briquets emerging from machine are water-sprayed and pass over a cooling conveyor to storage or loading.

[FIRST OF TWO ARTICLES ON MODERNIZATION AT PITTSBURG & MIDWAY COAL MINING CO.]

KANSAS STRIP MINE

Includes Combination Haulage In Modernizing From Pit to Preparation

By an extensive modernization program in the fall of 1940 this company developed a new strip mine in 18-in. coal and remodeled a central cleaning plant now streamlined for efficient 700-ton-per-hour production. The story is in two articles and begins with this history and account of new No. 18 mine employing combination haulage, which is an abrupt change from the previous method of loading railroad cars on the highwall.

By CHARLES LAMBUR JR.
Assistant Editor, Coal Age

MODERNIZATION for more than a decade by the Pittsburg & Midway Coal Mining Co., Pittsburg, Kan., exemplifies progressive planning to lower costs and increase efficiency. The company's history reflects this by continuous development and adaptation of new procedures and equipment. In the fall of 1940 another $300,000 modernizing program was completed.

A brief history is traced from the original No. 10 mine, at Midway, Mo., and the No. 15 mine, opened in December, 1929, and still operating in the 22-in. Mineral seam, two miles west of West Mineral, Kan. When, in 1933, No. 10 mine was worked out it was replaced by No. 17, mining the 22-in. Mineral seam 5 miles southwest of Pittsburg. The No. 7 mine was replaced in November, 1940, by No. 18, mining the 16- to 18-in. Bevier (locally called 18-in. or Limestone) seam, 2 miles northwest of West Mineral. Both Nos. 10 and 15 mines handled their own preparation.

Experiments in coal washing began at the Missouri mine in 1931. A 250-ton-per-hour four-track preparation plant at West Mineral, Kan., served the No. 15 mine. It was remodeled and became a central cleaning plant in 1933, when No. 17 mine output was shipped 16 miles to it. A Link-Belt rotary dump to empty 50-ton railroad cars, a cone-type washer, thickeners and a dryer were installed, and it was enlarged to five tracks with an output of 550 tons per hour. In 1934, two McNally-Norton boxes were added to wash cone refuse and screenings. Four Deister Overstrom Diagonal Deck tables for washing fine coal (minus 1-mm.) were installed in 1935. A plant to recover pyrite from refuse also was constructed at this time. When No. 18 mine was opened, the cleaning plant again was modernized.

A complete change was made from a high-density to a jig method of washing large sizes. Four wash boxes and four wash tables now prepare the entire output. Three vibrating screens, a 105,000-gal. sludge settling tank with drag conveyor to recover settlings, a constant-head wash-box water-supply tank, streamlining the flow of coal and the exterior, and an increase of from five to seven tracks and from 550 to 700 tons per hour output were included in the improvements which allow preparation of 30 different sizes.

No. 18 mine employs a 750-B shovel with 25-yd. dipper for overburden removal and a 75-B horizontal thrust loader with 5-yd. dipper to load coal. Both of the units are from the worked-out No. 17 mine and originally were in use at No. 10 property. They have been rebuilt several times and the stripping dipper has been increased from 16 to 20 yds., counterbalance applied, and finally the new light type 25-yd.-capacity bucket added. Before being moved to No. 18 pit the stripper was dismantled and overhauled. Motors were rewound and new racking, pinions, bushings, roof, etc., were installed.

Overburden is blue slate and surface and averages 17 ft. with maximum stripping limit set at 30 to 35 ft. Where shooting is required a Sullivan gasoline-operated sidewall drill makes 5-in. 60-ft. holes in the slate 2 ft. above the seam. Average charge is 225 lb. of 3½- and 4½-in.-diameter black powder cartridges with 125 lb. of the 4½-in. placed at the back of the hole. Pit width is 95 ft. and the stripper makes a 20-ft.-high toe-wall of heavy rock on the spoil side to eliminate sluff and roll from the high stack and to give the stripper a maximum of short dumps.

The 18-in. seam has little dip, contains a lot of pyrite pot rock and is broken by ¼- to 1-stick charges of pellet powder in 2-in. holes made by jackhammer and fired singly on 6x12-ft. centers. It is underlaid by 4 in. of fireclay and then limestone. Besides drainage ditches on the highwall the pit is kept free of water by two Mc-

Nally 4-in. and two Rex 2-in. centrifugal pumps, each operated by a gasoline engine. These engines have eliminated transformers and cable required for electric-driven auxiliary pit equipment. Stripping and loading shovels are the only electrical equipment in the pit and utilize 4,160 volts a.c. brought in by laterals of General Electric Type RR trench-lay cable. A total of 6,000 ft. now is in use and each has three ground lines.

Experience has shown that rail haulage from pit to washery is a costly and inconvenient method because advances are made so fast with the present-day large-size stripping and loading equipment that it is a continuous job to keep track moved. Therefore, combination haulage was installed at No. 18 mine.

Butane Drives Trucks

Three Dart tractor 40-ton semi-trailer trucks with United Iron Works two-door manually operated drop-bottom bodies haul an average of 1 mile from pit to railroad transfer station. Each is powered by a 225-hp. Hercules engine operated by butane fuel contained at 45-lb. pressure in an 87-gal. tank. Butane is a liquid under pressure, makes no carbon and is said to give at least 15 per cent more power than gasoline. Average consumption is 1 gal. per mile. It is delivered by truck at a total cost of 5.6c. per gallon, made up of 2.5c. purchase price, 1.5c. federal tax, and 1.6c. haulage charge. Storage at the mine is in a 4,840-gal. tank.

Trucks require eight 12x24-in. tires on the semi-trailers and ten 11x24-in. tires on the tractors. All are Goodyear lug types. Haulage road is outside the crop line and trucks enter the pit by ramps at one-half-mile intervals through the spoil banks. In the pit they travel on the fireclay or seam, depending on mining conditions. Roads are maintained by a Caterpillar RD-7 tractor with La Plante-Choate 10-ft. blade, and a No. 38 road patrol. Maximum grade is 3 per cent. After grading, 12 to 14 in. of shale rock is laid and topped with 6 in. of cinders which are well packed and then surfaced by a hard-oil macadam.

Trucks and semi-trailers are housed in a 54x106-ft. tile combination garage and shop. The garage is 12 ft. high and separated from the shop by a tile wall. The shop is 16 ft. high and 45x54 ft. and has 20-in. I-beams to support a traveling crane if installed. There is a pit, trip hammer, drill press, forge, welding apparatus, etc.

Overburden is stripped by this 25-yd. dipper and electric shovel fed by trench-lay cable.

One of three 40-ton semi-trailer tractor trucks with two-door drop bottoms that haul from the pit to the railroad transfer station.

General view at Mine No. 18 showing office and combination garage and shop and railroad transfer station.

Inner Strength

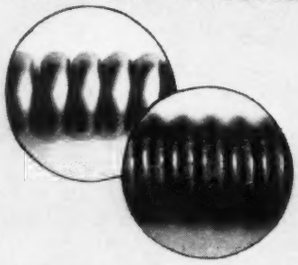
The New TRI CLAD Motor

* New FORMEX WIRE maintains

ITS DIELECTRIC FILM UNDER SEVERE CONDITIONS

ABRASION

Formex wire is insulated with a vinylacetal-type plastic developed by G-E engineers after 10 years of research. Tests of resistance to abrasion show a 3-to-1 superiority of Formex wire over high-grade enameled wire. Formex wire in *your* motors gives added assurance of dependable, continuous operation.

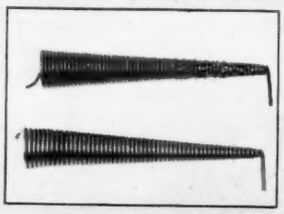


ELONGATION

Compare the two pictures above. The top photo shows Formex wire stretched 20 per cent and wound on its own diameter. The lower picture shows enameled wire stretched 10 per cent and wound on twice its diameter.

HEAT SHOCK

The top sample (below) shows what happens to good enameled wire when it is wound in a helix and heated to 150 C. Formex wire (shown at bottom) is unaffected by this heat shock. That is why it does not become brittle and crack away even after years of strenuous service.



Extra Protection

against physical damage

Strong, one-piece, cast-iron frame and end shields, with upper portion completely enclosed, protect vital motor parts from external blows, flying chips, settling dust, dripping liquids.

...built for protection first ...to last!

Begins WITH FORMEX*

NO "MUMMY INSULATION" HERE

With Formex wire, G-E engineers were able to "take off the wraps" on random-wound motors. Away went organic "mummy" coverings and heat-enclosing compounds. Having Formex wire, G-E engineers built a stronger, tougher motor insulation.

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When you're looking for a longer-lasting motor—one that won't wilt and weaken after years of strenuous service, or fail you in an emergency—you want the Tri-Clad motor with its *inner strength.*

When G-E engineers designed the Tri-Clad motor, they saw that the toughness of Formex wire insulation opened up new opportunities for strengthening the entire coil assembly from the inside out. They utilized new G-E synthetic-resin bonding varnishes to give rigidity and extra resistance. They fortified the slot-cells. They welded internal connections.

Finally, they selected for application on end turns a coating of Glyptal No. 1201 Red as an additional armor against the many adverse operating conditions commonly found in industrial service.

Thus, in the Tri-Clad motor you get a more compact winding—one that dissipates heat quickly and keeps the motor young.

With double-end, "controlled-velocity" ventilation and advanced electrical design throughout, the Tri-Clad motor's tougher coil windings mean extra years of service. Next time you order induction motors . . . . make sure they are Tri-Clad motors. General Electric, Schenectady, N. Y.

Integral-hp sizes up to 20 hp (at 3600 rpm), open or splashproof, are now available—also capacitor-motors in sizes up to 5 hp.

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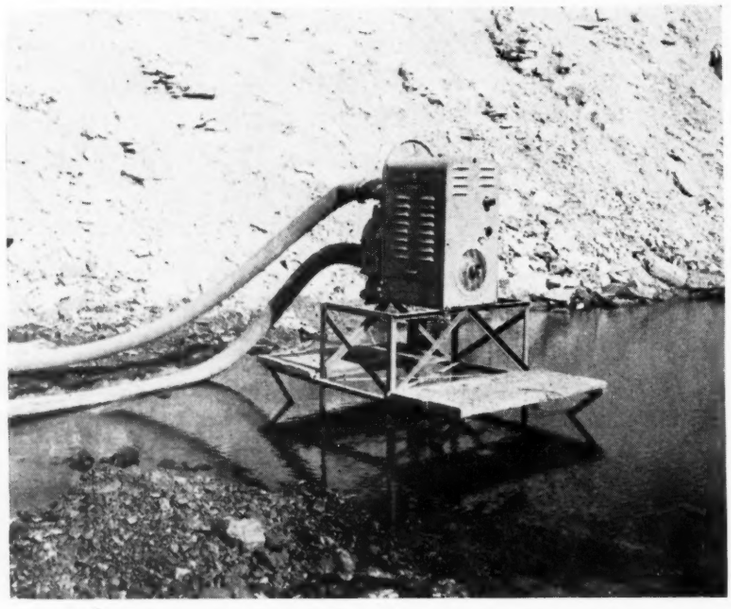
GENERAL ELECTRIC

750-50-8058

All of the doors are steel, packed with rock wool and hung on horizontal runners. Roofing is a 3-in. layer of chat and asphalt. Total cost of construction was $4,700. For efficient operation in the winter, thermostats had to be installed in the truck-motor heads. All oils and greases are Shell.

At the transfer station trucks empty into a 50-ton steel hopper. It discharges at a rate of 400 tons per hour by a reciprocating feeder into a McNally 30x48-in. double-roll crusher which has cast-steel staves and 7-in. teeth that crush to 12 in. The product is carried by a 36-in. 120-ft. drag conveyor to a one-track raw-coal tipple where railroad cars are loaded to 55 tons. This is an increase of 5 tons per car over former pit rail haulage methods. Cars are dropped by gravity and spotted by a friction drum. Grade on the hill is 1½ and 2 per cent at the tipple. The high-track capacity is 41 and the low 45 cars. Total horsepower at the transfer station is 70, including motors of 30 hp. on the conveyor, 30 hp. on the crusher and 10 hp. on the feeder. Power is 440 volt a.c. from the Kansas Gas & Electric Co.

This horizontal thrust loader with 5-yd. dipper removes the 16- to 18-in. seam.



All auxiliary pit equipment is operated by gasoline engines and here is one of several portable pumps.

Average production per shift is 40 cars, which are hauled 3 miles by a 100-ton steam engine to the central cleaning plant. This haul is over an abandoned bed leased from the M.-K.-T. R.R. and was rebuilt, including new ties, ballast, 70-lb. rail plus fills and grading to connect with the truck transfer station. Having operated rail haulage mines for several years, the company has a good supply of rail equipment which includes 50-ton flat-bottom cars, two 100-ton steam engines (one as spare), two 35-ton Vulcan gasoline locomotives and two 25-ton units as spares. The steam engine serves cars to both Nos. 18 and 15 mines and the 35-ton locomotives serve cars to the loading point at No. 15 mine.

Less Than 50 Men Per Shift

Total average number of employees at No. 18 mine is 47, including the superintendent, his assistant and three stripping shifts. They are: five at the stripper, made up of three ground men, one operator and one oiler; ten at the loader, which include two drillers, two shooters, four pit men, one operator and one teamster; three truck drivers; one transfer-station operator; two hopper attendants; two car droppers; five track-maintenance men; two tractor drivers; one blacksmith; one mechanic and three night watchmen. At an output of 2,200 tons per shift the life of the mine is estimated as eight years.

At No. 15 mine overburden originally was stripped by a 385-B shovel having a 12-yd. dipper which was replaced in 1939 by a 950-B having a 33-yd. dipper. The 50-B horizontal-thrust coal loader with 2½-yd. dipper was replaced by an 85-B unit with 5-yd. dipper. Overburden is shale and surface and averages 28 ft. thick and pit width is 75 ft. The 22-in. seam dips 20 ft. per mile. Where shooting is necessary a sidewall drill makes all holes. Haulage is by 50-ton railroad cars loaded on the highwall by an 80-B crane which hoists a 10-ton drop-bottom skip from the pit. Average output is 50 cars a shift and round-trip haul is 8 miles over 60-lb. rail. Originally six 30-ton drop-bottom cars were used. However, these were discarded in 1933 when the rotary dump was installed at the central cleaning plant.

CONVEYOR CREWS

Average Nearly 16 Tons per Man At Western Pennsylvania Field Operation

By W. B. BANNISTER
Mining Engineer
Clinton Block Coal Co., Imperial, Pa.

DISCUSS mining with any western Pennsylvania operator working the Pittsburgh seam and the drawslate problem invariably will enter the discussion. Perhaps the most serious aspects of this problem are the economic disposal of the drawslate and the hazardous working condition it presents.

Common practice in this field has been to mine out the underlying coal seam and then take down the drawslate and either gob it along the ribs or load it for disposal outside of the mine. With hand-loading, this practice was fairly satisfactory—but quite expensive. The slate could be barred down on top of the coal and the loaders could then pick off the slate and maintain a clean product. As the slate was taken down before the actual loading operation took place, the men did not have to work under it.

Shifting to mechanical loading, however, presents a different problem. Faces must be shot harder to roll the coal away from the face so the fall can be attacked by the loader. The heavier charges used to shoot the coal in this manner badly fracture the overlying slate so it usually comes down with the coal. If it remains in place, the loading machine, restricted by the timbering required to hold the slate, cannot operate successfully. In either case, a dirtier product results because it is not possible to clean small pieces of slate from the discharge boom of a loading machine.

Faced with the problem of overcoming these handicaps while still capitalizing on the economic advantages of mechanical loading, management of the Clinton Block Coal Co. found the answer to its problem in conveyor mining. Use of shaker conveyors and automatic, self-loading duckbills made possible the practice of posting the drawslate in place and extracting the coal seam from beneath. Because the duckbill is not much hampered by restricted space, the drawslate can be held by crossbars and posts set on about 36-in. centers. After the room is driven to its full depth, the posts and crossbars are withdrawn and the roof is allowed to cave.

When shakers and duckbills were first introduced in this mine they were installed in a section which had been developed on a double-entry system by hand-loading methods. Nine short rooms, 30 ft. wide on 33-ft. centers,

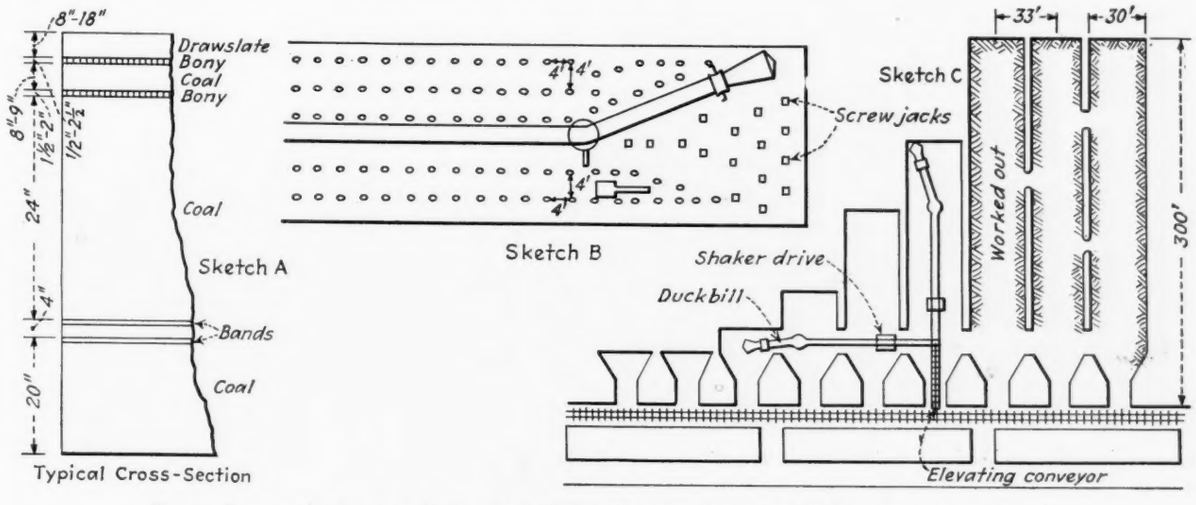
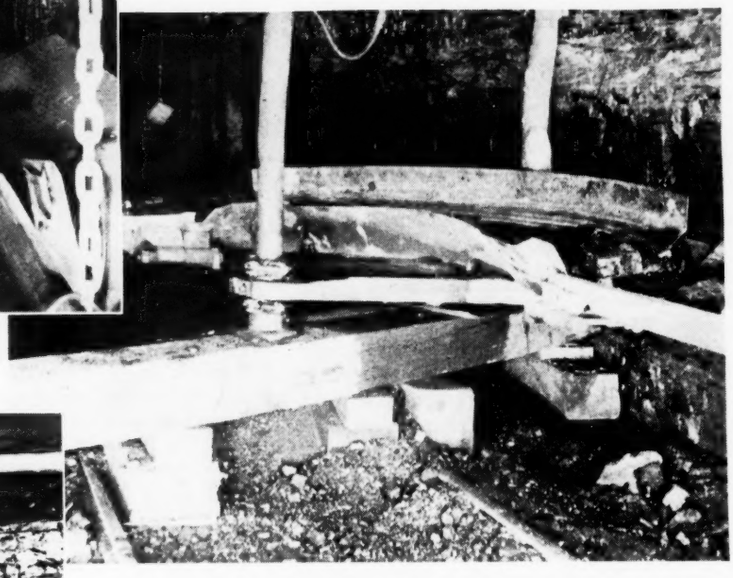


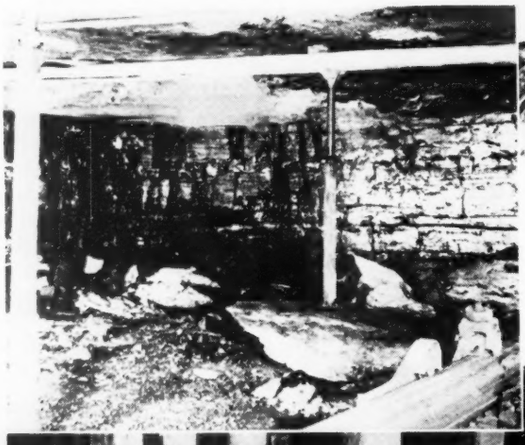
Fig. 1—Seam and mining method with duckbills under drawslate in "Old Section," Clinton No. 1. One duckbill with shaker shown extending a monkey heading and the other in room work. When monkey heading was completed both duckbills were used in rooms.

Elevating conveyor receiving discharge from two shaker conveyor lines. This common discharge point is made possible by inserting a 90-deg. angle trough in one conveyor line.

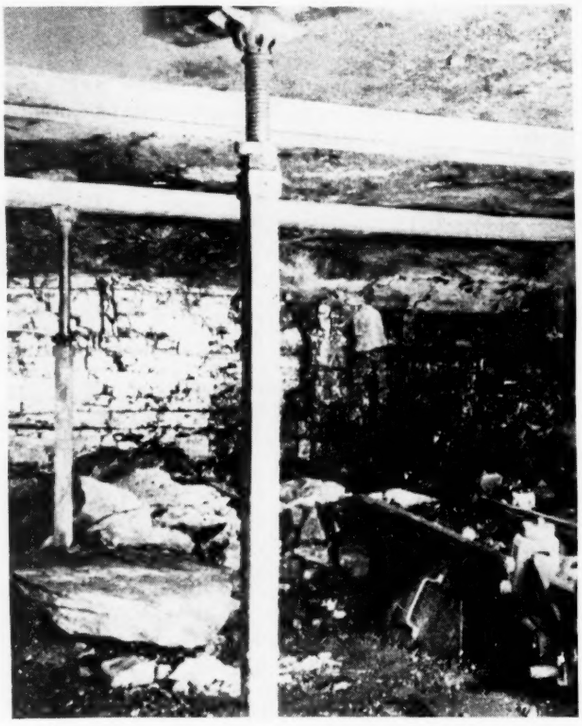
The 90-deg. angle trough.



Left rib; note drawslate in place in upper left.



Drawslate gobbed along rib; note close posting to protect the pan line.



Duckbill loading; note the two crossbars at the face.

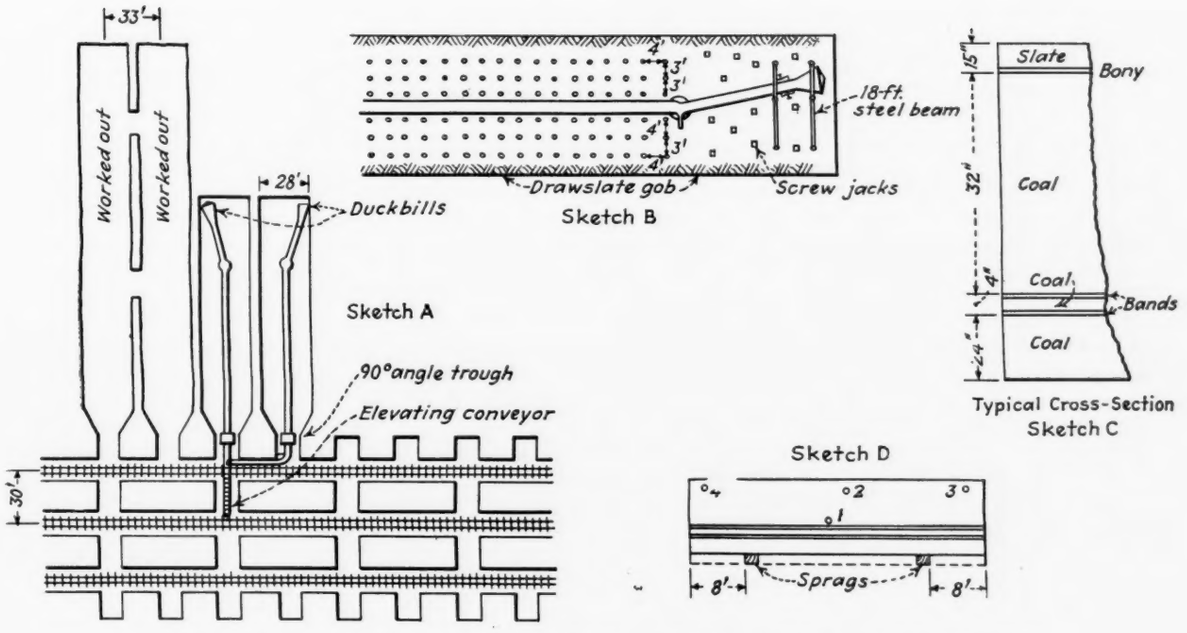


Fig. 2—Seam and mining method with duckbills in "New Hill Section," Clinton No. 1. Here drawslate is gobbed. Shot No. 1 is placed 2 in. above top band, Shots Nos. 3 and 4 are put 18 in. from ribs and 3 in. below slate. All holes are drilled at right angles to face. Drawslate is gobbed along ribs.

had been driven a short distance and stopped. A Type G-15-B-82 shaker drive with No. 2 pan line and a Type A3C duckbill were used to drive a "monkey heading" past the room necks parallel to the pair of headings. The second drive and duckbill were used to drive the rooms to the full depth of 300 ft. (see Fig. 1).

Both shakers discharged into a Type 90-L-22 elevating conveyor set in the crosscut, between the "monkey heading" and the haulageway. As soon as the "monkey" was driven up past the last room, both shakers and duckbills were placed in rooms and the section was worked out. The nature of the seam in the "old section" was such that the drawslate could be held by 18-ft. 4-in. 7.5-lb.-per-foot steel H-beams supported by screw jacks. As work progressed, however, it was found that the steel beams could be dispensed with and wood crossbars used in their place. Roof conditions were good enough that the crossbars were not used long and the drawslate was held in place by posts alone (*B*, Fig. 1).

The seam in the "old section" was composed, progressing downward, of 8 in. to 18 in. of drawslate, ½ to 2½ in. of bony, 8 to 9 in. of good coal, 1½ to 2½ in. of bony and 40 to 48 in. of good coal broken about 20 in. from the bottom by the "bearing-in" bands (*A*, Fig. 1). By posting under the lower bony band, the roof coal and the upper bony band protected the drawslate to such an extent that it could be held in place without the usual crossbars and posts.

To obtain as large a percentage of lump coal as possible, the posts were pulled after the rooms were driven up to full depth and the top good coal was allowed to fall. The larger lumps were picked out by hand and thrown on the conveyor. This practice, however, proved unprofitable, so the top coal was left in place.

Occasionally, local conditions present an even more difficult problem in that the nature of the slate is such that it cannot be posted. The Clinton No. 1 mine has just such conditions in the section (known as "the New Hill") now being operated with shaker conveyors and duckbills. There the slate not only varies widely in thickness but also is so soft and chalky that it breaks and falls between the crossbars and presents a very hazardous working condition. The seam in the "New Hill" section is composed, progressing downward, of about 15 in. of soft, chalky drawslate, ½ to 2 in. of bony and an average of 60 in. of coal broken by the characteristic "bearing-in" bands (*C*, Fig. 2). As the slate could not be posted even by using crossbars set close together, because the slate would break and fall between them, it was necessary to take it down, gob it along the ribs, and mine out the coal seam.

Rooms are driven 28 ft. wide, 280 ft. deep on 33-ft. centers, from a triple-entry system. Twelve room necks are driven in about three cuts deep on either side of the center heading. Crosscuts are driven across all three headings at every odd-numbered room neck. Roof is shot down in the center heading to provide height for the discharge end of the Type 90-L-22 elevating conveyor. This crosscut serves as a loading point for both sides of the panel. The elevating conveyor is set in the crosscut between the first and second headings and conveys the coal from the two Type G-15 B-82 shaker conveyors to the mine cars at the loading point (*A*, Fig. 2). The first conveyor discharges directly over the end of the elevating conveyor. The shaker to the right of the elevating conveyor discharges over the right side of the elevating conveyor.

Holes are drilled with a Chicago Pneumatic electric post-mounted drill. All holes are fired with Cardox. No. 1, the snub shot (*D*, Fig. 2), is drilled about 2 in. above the bands. Sprags are placed in the cut about 8 ft. from the ribs. When shot, the face breaks in an arch above the hole and does not spread across the face at the bands. Nos. 2, 3 and 4 holes are drilled straight into the face about 3 in. below the slate. It has been found that if the holes are angled from the face to the back of the cut, the coal will break properly to the slate at the back of the

cut, but will not part freely from the slate at the face.

Assuming the face to be undercut, kerf cleaned and all holes drilled, the loading cycle in room work where the slate is taken down is as follows:

1. No. 1, the snub shot, is fired and the fall cleaned out all the way to the back of the cut. By so doing, the Cardox in the wing shots, Nos. 3 and 4, has a free face to break to and the coal tumbles down into the open space provided instead of setting down on the bottom and packing. Because the explosive is not confined, not only is lump coal percentage higher but the tender overlying slate is not badly shattered.

2. No. 2, the center top shot, is fired and cleaned out. Two Templeton-Kenly safety screw jacks are placed under the slate to hold it in place until the right wing shot, No. 3, can be fired and the fall cleaned out.

3. No. 3, the right wing shot, is fired and the fall cleaned out. As soon as the fall is loaded, the slate is taken down and gobbed along the ribs. A Jeffrey shortwall mining machine is then moved from its parking place along the right rib to position at the face and sumped in preparatory to cutting across the face. Where the slate is good enough to stand up, the entire fall is loaded out before the slate is taken down and gobbed. In that case, the shortwall machine is not sumped until the room is entirely cleaned up and the slate is taken down and gobbed.

As soon as space permits, the cutting cycle takes place while the rest of the room crew gobs the remaining slate. This is the only part of the cycle that may vary from the established procedure. While one member of the crew is cutting, one man is cleaning up the last of the slate and the third man has erected his drill and is drilling Nos. 1 and 2 holes.

4. No. 4, the left wing shot, is fired and the fall loaded out. The overlying slate is taken down and gobbed, the drill has been set up at the left rib and No. 3 hole drilled.

5. As the shortwall machine nears the left rib, the other two members of the face crew have loosened the clamps on the telescopic trough and the trough bolts and have taken down the pendulum jack preparatory to advancing the duckbill.

When the cut is finished, the mining machine is moved back to its parking place along the right rib and the machine man then threads the rope from the machine through a face sheave to the feeder head assembly of the duckbill. When advanced to the proper position, a new pan is inserted in the pan line, the trough bolts are tightened, the clamps tightened on the telescopic trough and the pendulum jack reset. An 18-ft. steel H-beam is then set about 4 ft. from the face and held by screw jacks. This beam is always kept in place as a safety precaution. A second H-beam is kept about 8 ft. from the face and is advanced as the cuts are progressively loaded out (*B*, Fig. 1).

A crew is made up of six face men, one car trimmer and one foreman. These men do all the work in two places per shift. Because the slate is gobbed along the ribs, crossbars are not needed and one man of the face crew is able to do all the timbering in the room. (Most mines using shaker conveyors and duckbills in the western Pennsylvania area use at least two, and sometimes more, timbermen on each crew.)

Time studies show that 15 to 16.5 tons per man is average. This high tonnage per man is made possible by systematizing the face-preparation and loading cycles. Overlapping of the face-preparation and loading cycles makes it possible to load, cut, drill and timber simultaneously (Fig. 3).

As it was impossible to hold the drawslate, the management made the most of the timber time used at other mines in gobbing the slate at the Clinton No. 1 mine. By utilizing the time usually required to move screw jacks and place crossbars in systems where the slate is held, the tonnage per man compares very favorably with tonnages at those mines. No time is lost while waiting for face-preparation crews because all the equipment is concentrated in each of the two places.

Management of the Clinton mine has prepared an established procedure and spared no effort to synchronize the movements of the face crews so that high tonnage is loaded with a minimum loss of efficiency. The men do individual jobs at the face, but cooperate with each other so that the cycles of loading and face preparation are kept running smoothly and efficiently. High tonnage per man at low cost is possible because loading and face-preparation cycles can be overlapped; equipment is concentrated in two working faces and the men and equipment do not have to be moved from place to place in the mine.

Absence of any type of rolling stock in the rooms has contributed materially to the excellent safety record of the Clinton mine. No time is lost waiting on preparation crews, car-change time or tramming time. As the coal travel along a pan line is relatively slow it is possible to further clean the coal by picking out bands and impurities at the face and loading point. Because it is impossible to post the drawslate, the mine also has utilized decreased timber time made possible by gobbing the drawslate.

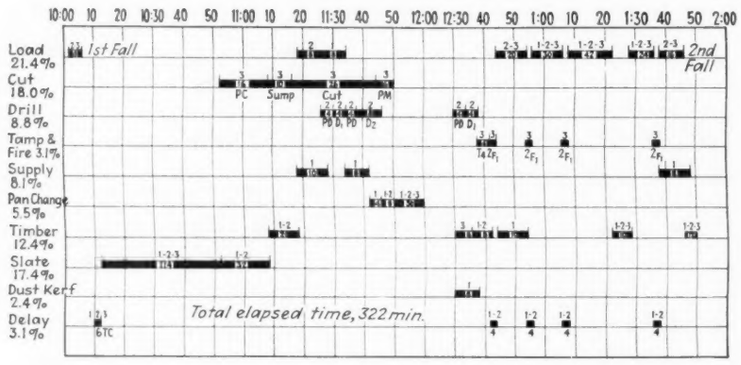


Fig. 3—Section of time study, duckbill loading, Clinton Block Coal. Co. T=tamp; P.C.=Prepare to cut; PM=park machine; TC=trip change; PD=prepare to drill; F=fire.

BOOM MAINTENANCE

Stepped Up at Ayrshire Patoka By Using Common Pipe in Rebuilding Job

By MYLES A. WALSH
Assistant to Superintendent
Fairview Collieries Corporation

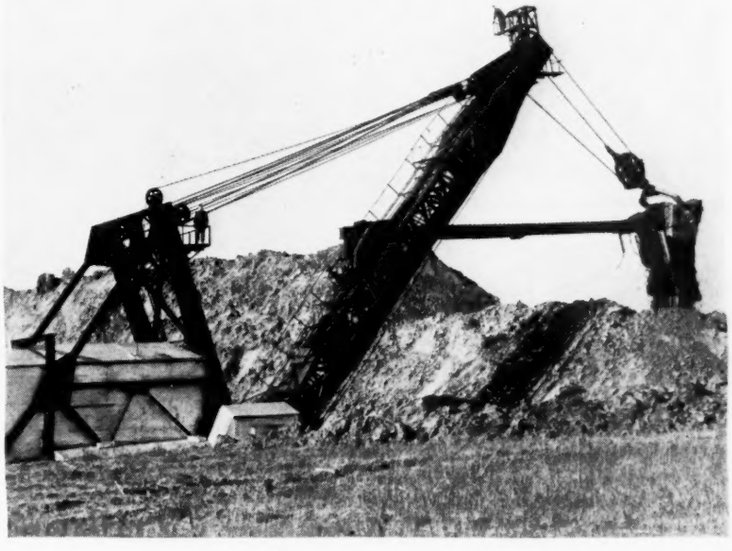
REPAIR of booms for strip-mining shovels has long been an expensive maintenance problem for Ayrshire Patoka Collieries Corporation at its various open-pit operations in Indiana. In the past, broken plates and beams have been patched with new plates and with splices, reriveting where necessary. This procedure over a period of years tended to add considerable weight to the boom, and, no matter how much reinforcing was accomplished, the method never proved entirely satisfactory.

Recently, at Ayrshire Patoka's Chinook mine, at Staunton, an 11-year-old boom for a 12½-yd. electric shovel was rebuilt by substituting common pipe for the boom's old "I" and channel-beam members. All the old posts and diagonals, as well as the plate-type stiffeners, were cut away with an oxyacetylene torch, and a systematic crisscross of pipes was substituted. Welding was employed throughout instead of riveting. The tubular construction permitted elimination of much of the boom's original top and bottom heavy steel plate, and also did away with all the reinforcing plates added during the repairs of previous years.

The reconstructed boom consists of 350 pieces of standard black pipe in 2½-, 3-, 4-, 6-, and 8-in. sizes. These are welded, using over 2 tons of welding rod, to the boom's top and bottom plate members and to an 8-in. pipe which traverses the outer sides of the boom along its length. Overall, the tubular boom is 101 ft. long and weighs 92 tons complete with fittings. Before reconstruction this same boom weighed 113 tons; the reduction of 21 tons in weight was made possible without any loss in the strength of the boom.

Aside from its streamlined appearance, the Chinook mine boom has a flexibility particularly appealing to the shovel runner. There is a definite shock-absorbing bend in the boom with each dig of the shovel's bucket. Even under the moderate pressure of the wind on a gusty day a welder notices this flexibility while endeavoring to hold an arc, for the boom bends slightly with the breeze. When a sleet storm covers the pipes with a crust of ice, the ice cracks from those pipes undergoing the most bending, thus revealing the individual pipe members absorbing the most shock during digging. These pipes are under constant observation and are holding well. Should any pipe fail, it can readily be repaired by welding without materially adding weight to the boom.

The success of this boom is largely due to the designer, Fred L. Plummer, consulting engineer, and to the willingness of the Ayrshire Patoka management to attempt something new. Using practically no equipment other than a cutting torch, the pipe, and welding machines, the management built this boom themselves at a substantial saving over the cost of a boom of the old type.



The 12½-yd. electric stip shovel in action at Chinook mine.

FOREMEN'S QUESTION FORUM

Hazards Connected With Mine Mechanization How They May Be Combated*

By J. F. CONRAD
Electrical Inspector
Pennsylvania Department of Mines
Ebensburg, Pa.

TO INVEST a large sum of money in precision equipment in a factory and have it maintained and operated by unskilled hands would be foolish and the average manufacturer would not take such an unreasonable risk because he depends on skilled workmanship for profits. On the other hand, the coal operator depends on mass production for his return and might not be so particular in the selection of his working force if it were not that, unlike the manufacturer, he is confronted with physical hazards that, if not adequately guarded against, may obliterate suddenly the profits for years to come. Unfortunately, there is a dearth of competent men to service modern machines and electrical systems. Training is the most effective, least expensive, dividend-paying insurance that can be devised against major disasters.

Even a Permissible Machine Is a Constant Hazard—Only periodic inspections will keep permissible machines safe, and they still will be dangerous if haphazard and unvulcanized splices are permitted, and, as splices are likely to be defective, it is well to have as few of them as reasonably can be arranged. Makeshift connections, fuses and ground attachments should not be permitted, nor should parts be substituted or alterations made in permissible machines. Splices carelessly made and makeshift connections introduce much resistance, resulting not only in voltage drop but in an excessive rise in temperature which, long continued, destroys insulation and sometimes sets fire to cable.

Track-mounted loading machines and cutters must be handled with care and blocked when left standing on gradients or they may run away. Some makes of machines for shearing and cutting have built-in drags at the rear to prevent them from backing down gradients. Men should be trained thoroughly to control the rear conveyor, for in maneuvering that section of a loading machine into position, operatives often fail to release the controls in time to prevent the boom from striking men and timbers.

Shuttle-Car Hazards — Large pieces of rock, when being loaded by loading machines, may overbalance and fall, damaging electrical inclosures, head lamps and wiring. Reel-type shuttle cars mounted on pneumatic tires should have a three-conductor cable containing a positive, negative and grounding conductor mounted on a synchronous cable reel. Mining machines mounted on caterpillar tractors, though they should be equipped with a three-conductor cable, are not as likely to administer shock as the shuttle car because they are in direct contact with the earth. Because shuttle cars operate noiselessly and because those that operate them do not always have a clear view ahead, they should be provided with alarms which, when the machines are in motion, will sound continuously. Where shuttle-car haulageways are not kept clear of large pieces of rock or coal, the operative may lose control and timbers may be displaced, causing roof falls. Unless rooms and headings are kept free of overhangs, shuttle-car operatives are likely to have their heads crushed. High-pressure tires should be inspected daily for cuts and abrasions. A man may lose control of his machine if a blow-out should occur.

Mine No Safer Than Its Splices

Keep Splices 10 Ft. From Equipment—In chain-flight conveyor mining, all face conveyor motors should be cleaned of fine coal at the end of each shift. Use of splices in all cables should be discouraged and, if used, they should not be permitted within 10 ft. of the equipment to which they are attached. In shaker-conveyor mining one of the best remote-control methods is the use of an automobile dimmer switch and sash cord. The switch is mounted outby the room neck near the conveyor motor. The sash cord is attached to a specially designed switch lever and extends to the face of the room. A single pull of the cord either stops or starts the conveyor motor.

Cables connected to electric drills should derive their power through a properly fused permissible switch box located a convenient distance from the working face. Power for loading and mining machines should be received from permissible junction boxes located about 70 ft. from the point of operation. Trailing cables in conveyor mining should be wound in a figure eight around knobs mounted on suitable skids, thus avoiding kinks and prolonging cable life.

Color Standardization of Cables—Cable color should be standardized so that men changing from one mine to another using cable with colors of a different significance would not mistake conductors and be electrocuted, as sometimes has occurred. Outside diameters of cables also should be standardized. Danger may develop where cables are installed that are too small for permissible packing glands, which if not properly packed may permit flames of an internal explosion to pass to the surface, developing, if conditions favor, a major disaster.

All mining machines except those used on rails should be protected with ground wires effectively connected and of adequate carrying capacity. This part of the electrical system should be given serious consideration, for ground-wire interconnections of several machines, such as drilling and mining machines, will complicate the hazard and in a great measure defeat the purpose for which the ground wires were installed. Each machine should have its own ground wires unless devices are provided to indicate open circuits and are arranged so as to disconnect the power from the machine when grounds develop. Machines equipped with ground wire are not necessarily safe. The insulation of machines should be tested frequently by suitable instruments so as to determine defects before the insulation fails and to permit repairs to be made before men are shocked or methane ignited.

Safety Education Essential—To achieve maximum safety the introduction of safety practices must be supplemented by a training course for mechanics and electricians sponsored by individual coal companies. Well-trained electricians and mechanics who understand the safety features of permissible equipment and are supplied with correct replacement parts are essential. To purchase the safest machines and to fail to give them the care of competent men and to supply them with the required replacement materials gives only a false sense of security.

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Air Blasts From Falls of Roof Are Like Typhoon Gales

Falls of roof displace large quantities of mine air with its accompanying impurities and in addition they may injure men, blow down timber and destroy brattices. At Bararee colliery, owned by the East Indian Coal Co., in British India, a big fall of rock in an area being depillared, in which the coal thickness was 27 ft., showed on a self-registering water gage 700 ft.

* Abstract of an address delivered at the meeting of the Mining Section of the National Safety Council, Chicago, Ill., and entitled "Electrical Safeguards and Practices in Mechanical Mining."

away from the fall a pressure of plus 0.9 in. and a backlash of minus 1.1 in. after the outward impulse ceased. So the outgoing velocity must have been just under 4,000 ft. per minute and the return velocity a somewhat higher figure. About 11,000 sq.ft. of roof gave way, but it was supported in part and did not cave through to the surface.

Three weeks later, after the pillar drawing had advanced a little, the roof caved again, this time to the surface. The area affected in the workings was 14,000 sq.ft. with a broken surface area of 2,800 sq.ft. and a cover of 110 ft.

In this case, the pen of the recording device was stopped by the center pin of the instrument toward the center of the chart and on the return blast the pen passed over the edge of the paper; the outgush of air produced a pressure of at least 1.6 in. water gage and the backlash was over 1.7 in.; how much more is not known; both pressures indicated that the air velocity exceeded 5,000 ft. per minute, or 60 miles per hour.

W. Kirby, the Chief Inspector of Mines of India, advocates that vent holes be provided in panel districts for release of pressure and places be excavated for the safe retreat of workers. In earlier years in another British Indian mine a blast of this character drove a rail with such violence that it actually impaled a woman.

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What One Anthracite Company Is Doing To Solve the Dust Problem*

By A. C. PETERSON

Safety Inspector, Hudson Coal Co. Scranton, Pa.

ANTHRACITE dust is being suppressed or its effects ameliorated in five ways: (1) by suppression at the sources as by water, (2) by dilution with air, (3) by substitution of material of low free-silica content for a material of high free-silica content wherever possible, (4) by replacing objectionably dusty processes by those that raise less dust, and (5) by respirators.

Use of water for wetting down muck piles is optional with the muckers and ventilation usually suffices to carry dust from the mucking crews. Since 1939, wet jackhammers have been in process of introduction in gangway and counter development wherever bottom rock had to be lifted for height. Much progress has been made with the intention eventually of having only wet drilling in such work.

Wet Undercutting and Mucking—In 1935 wet undercutting was first introduced in the solid chambers of the mines of the Hudson company being used in the dry bottom bed of two mines. Beds near the surface are quite generally wet even during development and first mining but the deeper lying beds often are quite dry during those periods. However, because the overlying strata fracture, even the deeper beds become wet shortly after pillar extraction begins. At another mine, to keep the face a longwall working wet, a small stream was diverted so that it flowed steadily down the face and materially reduced the dust from both undercutting and loading, but conditions of pitch and available water supply for such arrangement rarely occur together.

Ventilation to Clear Air—Use of auxiliary fans, subject to frequent inspection and strict rules governing installation and a supply of fresh air, has brought adequate ventilation to working places not ventilable by other means. Rockholes and boreholes of large diameter have been used to carry return air to workings in caved ground from adjacent beds. The dangerous practice of returning to working faces before the smoke has cleared after shotfiring has largely ceased as a result of enforcement of rules against that practice and by immediate investigation of every reported case of powder-smoke sickness.

Iron-Ore Tailings Displace Sand—Since 1923, the company has used iron-ore tailings containing only about 6 per cent free silica as "sand" for locomotives and cars. Ordinary sand formerly used for this purpose contained about 85 per cent of free silica. Mechanical loaders and conveyors have displaced many heavy gradients on which sand had to be used to restrain locomotives and loaded cars. Use of undercutters, though by no means general, is believed to have reduced on the whole the production of dust because normally they are operated only for ¾ to 1 hour during the shift. Though during that period they produce a high dust concentration, they effect such a substantial reduction in drilling and quantity of explosives that much less dust and fume is present during the rest of the shift. Such discontinuous use of undercutters is necessary because the machines are used on old pillars.

Percussion compressed-air drills have been displaced by electric drills in coal, with a reduction in dustiness. The electric drill was introduced three years ago in one of the Hudson mines that had been closed. It was in ill repute because it got out of control when it encountered cracks or sulphur balls. One of our mechanical engineers, however, developed a safety clutch that overcame this objection. A few such drills are used in another Hudson mine and recently, at the suggestion of S. H. Ash, a rotary type of compressed-air drill has been tried out.

Men are advised to use respirators where they find their use feasible, this being left to their judgment. About half of the miners and laborers have equipped themselves with them and use them when the work warrants. It is difficult to get them to keep them clean and to change filters frequently properly fitted in retainers with face pieces properly fitted to the wearer.

Most coal and rock is drilled by pick-hammer; no top cutters or shearers are used. Conveyors load 84 per cent of the coal mined, but they do not speed extraction as conditions do not favor concentrated mining or high production. Hence there is no high dust concentration.

Data on Hudson Coal Co.'s Mining Methods, 1940

Total production, 1940, 4,105,557 net tons salable coal	
Total machine mined production, 2,997,103 net tons	
Percentage of total production undercut	14
Percentage of mechanically loaded coal undercut	19
Percentage of total production loaded by scrapers	37
Percentage of machine-mined coal loaded by scrapers	51
Percentage of total production loaded by shakers	36
Percentage of machine-mined coal loaded by shakers	49
Percentage of mechanically loaded coal in 1932	41
Percentage of mechanically loaded coal in 1940	84

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Rock-Dusting Will Be in Vain If Coal Dust Is Ill Covered

To give best results, coal dust and rock dust must be mixed. The mine that lets a heavy coating of coal dust collect on top of its rock dust is only fooling itself. Thus buried by coal, its rock dust will give inadequate protection. British Safety in Mines Research Board's tests at Buxton prove this. A relatively low volatile dust (23 per cent volatile, dry ash-free basis) was raised into a dust cloud in the closed end of the Buxton experimental underground roadway and ignited by a mild flammation of firedamp. Without any further addition of coal dust, the flame spread 125 ft.

Then, a 4½-lb.-per-linear-foot 50:50 mixture of coal dust and limestone dust was spread for 250 ft. in front of such a dust cloud, and the flame "was extended by only 85 ft." (18th Ann. Rep. Safety in Mines Research Board, 1939). When, however, the same quantities of the two dusts were spread separately, one dust on the shelves and floor on one side of the road and the other dust similarly on the other side, the explosions traveled to the open end of the roadway, 410 ft. further.

Then the whole length of roadway was dusted, first with limestone, 4½-lb.-per-linear-foot, and then with coal dust, 2½-lb.-per-linear-foot, or a sixteenth of an inch thick. Though the average thickness of limestone to coal was 2:1 the explosion traveled the full length of the roadway.

Perfect admixture of the two dusts is not practicable, says the Research Board, but, by frequent applications of rock dust, a series of thin layers can be provided so that the rock dust will rise first and will be formed readily into a cloud. Summing up: Rock dust should be applied frequently to keep it near the top so that it will rise at the very start of an explosion. High percentage of rock dust is not the sole criterion, as many have thought; frequency of application may be equally important.

* Abstract of an address delivered at the meeting of the Mining Section of the National Safety Council, Chicago, Oct. 6.

QUESTIONS ASKED BY STATE BOARDS

Questions and Answers, Examination for Anthracite Foremen and Assistants*

Q.—What duties does the mine law impose on the mine foreman and assistant mine foreman?

A.—Mining law requires that the mine foreman or his assistants shall examine carefully at least once a week all accessible parts of abandoned portions of mines in which explosive gases have been found, and that all danger found shall be immediately removed. Report of such examination shall be recorded in a book kept at the colliery for that purpose, such report to be signed by the person making the examination.—Rule 4, Art. XII.

In mines generating explosive gases the mine foreman or his assistant, every morning, before the workmen shall enter the mine, shall examine carefully all working places, traveling roads and all other places where the safety of workmen might be endangered, and such examination shall be made with a safety lamp within three hours before time for commencing work, and no man shall enter the mine or working place until it is reported safe. Every report must be recorded in a book kept at the colliery for that purpose and be signed by the man who makes the examination.—Rule 5, Art. XII.

The mine foreman or his assistant shall examine every working place in the mine every working day while the men of such place are, or should be, at work and shall direct that it be made safe by props or timber, that all loose coal or rock be pulled down or secured and that no one shall be permitted to work in an unsafe place except for the purpose of making the place safe, but, if the mine is idle 48 hours or more, the mine foreman or his assistants shall examine every working place the day before operations are resumed.—Rule 12, Art. XII.

If he sees fit, the mine foreman may cause men to be searched for matches, smokers' articles or any other material or article which may cause fire, apparently only if the men are working in a mine or portion of a mine worked by locked safety lamps or by locked safety lamps and electric lamps.—Rule 10, Art. XII.

No blast shall be fired in any mine where locked safety lamps are used except by permission of the mine foreman or his assistants, and before giving such permission the person in charge must examine the place and adjoining places and satisfy himself that such a blast can be fired safely.—Rule 11, Art. XII.

All slopes, shafts, main roads, traveling ways, signal apparatus, pulleys and timbering shall be examined at least once every day by the mine foreman or some other competent person or persons designated by him.—Rule 13, Art. XII.

At every shaft or slope in which provision is made in the act for lowering or hoisting persons, a headman and footman shall be designated by the superintendent or foreman.—Rule 40, Art. XII. The mine foreman also has charge of all matters pertaining to ventilation and speed of ventilators.—Rule 3, Art. XII.

* Continued from p. 126, *Coal Age*, October, 1941.

Queries Asked First and Second Class Foremen At Examination Held in State of Ohio*

Foreman's First Day on Job

Q.—On assuming charge of a mine as a mine foreman, what information would you consider it necessary to obtain for an intelligent performance of your duties?

A.—I would examine the last report of the mine inspector under Sec. 31 and see if the orders there made have been complied with, whether no more than 65 men are at work in any one air split, which number the law allows (Sec. 54) and whether, if 66 to 90 men are so employed, written consent to their presence in that split has been obtained from the chief of the Division of Mines. In cases where a change is deemed impractical, a larger number of men can work on the split for a period of ten months from the approval of the law.

If booster and blower fans are installed, inquiry should be made as to whether their use has been approved by the chief of the Division of Mines (Sec. 54). The foreman should ascertain if the fan runs at all times. If the mine is non-gassy, he should find how long and at what hours the fan is permitted to be stopped and obtain evidence that written permission of the mine inspector has been granted for stopping during such period.

The incoming mine foreman should satisfy himself (1) that pillars in rooms and in room entries are not longer than allowed between crosscuts, and in rooms are regularly staggered from room to room; (2) that pillars in mine entries which have no rooms are nowhere more than 100 ft. long; (3) that the headings are kept not more than 100 ft. ahead of one crosscut until another crosscut has been completed, all in accord with Sec. 58; and (4) that, if such distances have been exceeded, whether permission for such deviation has been given by the chief of the Division of Mines.

The mine foreman should ascertain that, in accordance with Sec. 73, the clearance between the top of the widest mine car and the near rib in all headings is at least 14 in. on the side of the heading opposite the trolley wire or feed wire or on the wire side if the brakes are on that side of the heading. However, if the clearance is not provided, it must be ascertained (1) that the headings were driven prior to the passage of the act of 1941 or (2) would necessitate a greater width than is safe in the opinion of the chief of the Division of Mines. Many other details should be studied to see that they comply with the law. Only those requirements which the chief of the Division of Mines can modify to suit conditions have been stated in this answer.

Law of Mine Approach

Q.—What is required by law when working places are driven toward abandoned workings?

A.—To avoid an overpowering inundation of water or a dangerous inflow of extinctive or explosive gases, Sec. 93 of the Mining Act of 1941 requires that, as soon as the face of any working place in a mine approaches within 100 ft. of the abandoned workings of another mine or is being extended within a distance of 100 ft. therefrom and wherever such abandoned mine contains firedamp or water which latter may inundate such working place, or cannot be explored to find out what it contains, the mine foreman shall not permit the place to be advanced until a hole in the center of such working and a flank hole in each rib have been drilled in the solid for a distance of not less than twice the length of the cutter bar. These holes shall start at the face of the working place and a set of three shall be drilled after each cut or crossing has been taken out.

This distance of 100 ft. shall be increased to 150 ft. where the limits of the abandoned mine have not been revealed by actual survey. Competent shotfirers must be employed in all working places which are advancing or running parallel with such an abandoned mine.

Clearances and Refuge Holes

Q.—What is the law in regard to travelingways and refuge holes?

A.—Slopes and mechanical haulageways used as travelingways by persons, employed in a mine, says Sec. 72, must be made of sufficient width to afford not less than 3 ft. of space between the rib and adjacent side of car or mechanical device so that persons can pass moving cars with safety. If found impracticable to make such slopes or mechanical haulageways of the width thus required, refuge holes not less than 6 ft. in width and clearing the adjacent rail of the track not less than 4 ft. and located not more than 60 ft. apart shall be made on one side

* Continued from p. 127, *Coal Age*, October, 1941.

of the slope or mechanical haulageway, and these shall be properly marked and whitewashed, kept free from obstruction with sides and roof made secure. The deputy mine inspector in his discretion may prohibit walking on such slope when cars are being hoisted or lowered upon it. A traveling or passageway from one side of the shaft bottom to the other must be provided and kept free from obstruction.

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Questions, Mine Examiners' Examination State of Illinois, 1940*

Q.—What are the chief causes of mine fires and how would you guard against them?

A.—The chief causes of mine fires are: (1) accidental ignition of gas blowers when blasting coal; (2) spontaneous combustion of fine coal and slack in waste and abandoned places in mines; (3) open lights in stables, pumprooms, engine rooms and other places where hay, waste and like combustible materials are used; (4) short-circuiting of electric currents, or blowing of fuses, or (5) ignition of methane by sparking of wires. Mine fires may be caused by a local explosion of methane or dust at the working face or by the ignition of methane by bits while cutting coal. The best safeguards against mine fires are: (1) use of permissible explosives; (2) prompt loading out of all fine coal and slack; (3) use of protected lights in stables, pumprooms, etc.; and (4) enforcement of strict rules in reference to electricity, blasting and methane.

Q.—What are the principal causes of explosions in coal mines, and what precautions and measures should be taken to prevent them?

A.—Some of the more common causes of explosions of gas and dust in mines are the following: (1) Inadequate ventilation allowing methane to accumulate in working places and in void or abandoned portions of the mine; (2) lack of thorough inspection and removal of accumulations of gas and dust; (3) blowout shots due to the excessive use of black powder in blasting; (4) overcharging of drillholes; (5) drilling a hole too deep on the solid or blasting coal without preliminary cutting; (6) insufficient tamping, or tamping with coal slack or other flammable material; (7) failure to use permissible powders; (8) failure to employ competent shotfirers to examine, charge and fire all shots, except any that may in their judgment be unsafe; (9) use of mixed lights in a mine; (10) lighting matches or smoking in a gassy mine and permitting matches or tobacco to be taken into a mine; (11) use of defective or poorly designed or improperly cleaned safety lamps; (12) use of safety lamps by inexperienced men; (13) tampering with a safety lamp; (14) fooling with safety lamps and with gas; (15) failure to ventilate properly abandoned workings in a mine; (16) lack of mine discipline and disregard of provisions of State mining laws; and, finally, (17) failure to enforce mine rules and regulations.

To prevent, as far as possible, these disasters requires strict mine discipline, a thorough inspection of the mine at regular intervals by competent mine examiners, and a strict compliance with all mining laws and regulations by mine officials and mine workers. Where conditions require, all shots should be fired by competent shotfirers who are authorized to examine, charge and fire all shots that in their judgment are safe. A reliable and adequate system of ventilation must be provided and roads, airways and working places kept free from accumulations of gas and dust.

* Continued from p. 63, *Coal Age*, September, 1941.

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Questions, Mine Foremen's Examination Bituminous, Pennsylvania, 1941*

Q.—What information in regard to the following should be shown on the mine map: (a) excavations, (b) boundary lines, (c) ventilating currents, (d) elevations, (e) water, (f) gas wells, oil or gas pipes; (g) adjoining mines?

A.—(a) All openings, excavations, shafts, slopes, drifts, tunnels, planes, main entries, cross entries, and rooms and the number of each. (1 per cent.)

(b) An accurate delineation of the boundary lines between said mines and all adjoining mines or coal lands, and the relation and proximity of the workings of said mine to all adjoining mines or coal lands. (½ per cent.)

(c) If requested by the inspector, the blueprint in the office at the mine shall show by arrows the direction of the air currents in said mine, each split to be pencilled in a different color. (½ per cent.)

(d) The map or print shall show the elevation above or below mean tide at Sandy Hook of the top and bottom of each shaft and slope, of all drifts, tunnels, planes, and at the faces of entries, as found at each semi-annual survey, and in rooms and entries adjacent to boundary lines between such mine and any adjoining mine or mines at points not more than 300 ft. apart. It shall show the elevation of streams, rivers, lakes, dams, or any other body of water on the surface, also any body of water dammed in the mine, or held back in any portion of the mine. (1 per cent.)

(e) It shall show also the location of streams, rivers, lakes, dams, or any other bodies of water on the surface, or any body of water dammed in the mines, or held back in any portion of the mine giving the true area of said body of water unless inaccessible before the passage of the act. (1 per cent.)

(f) The map shall show the location of all boreholes penetrating the coal strata, the location of all oil and gas wells, and oil and gas pipes. (1 per cent.)

(g) When the workings of a mine are within 300 ft. of the boundary lines between such mine and any adjoining mines, application shall be made by the operator or superintendent to the inspector for information as to the proximity of the workings of such adjoining mine or mines, and if the workings of such adjoining mine or mines are, at their nearest point, within 300 ft. of such boundary line, the inspector shall so notify the said operator or the said superintendent, who shall have such portions of the workings of said adjoining mine or mines surveyed and shown on the map of the mine first mentioned. (1 per cent.)

Q.—(a) Name four gases that may be found in bituminous coal mines. Give symbols and specific gravities of each gas. (b) State where each gas usually is found. (c) What are their effects on life? (d) Name the poisonous and non-poisonous gases. (e) Name the combustible and non-combustible gases. (f) How would you remove these gases from the mine?

A.—(a)

Methane	CH_4	0.5543
Carbon monoxide	CO	0.9672
Carbon dioxide	CO_2	1.5282
Hydrogen sulphide	H_2S	1.1898

(U. S. Bureau of Mines, Information Circular 6983, p. 1)

(b) Methane is found issuing from the coal and surrounding strata, especially at clay veins, after roof falls, and at the return side of falls and gobs where the gas is being drained away. Carbon monoxide usually is found in the vicinity of gob and mine fires, after mine explosions and after the firing of explosives. Carbon dioxide is found where complete combustion of carbonaceous matter is in progress in a free supply of air. It is produced by mine timber, the burning of lights and explosives and the breathing of men and animals. It exists also in variable quantities, as an occluded gas in coal seams and the contiguous strata, and is evaporated to a limited extent from mine water which has been holding it in solution. Being heavier than air, its tendency is to accumulate at the floor of the mine and in lower dip workings. Hydrogen sulphide occurs only in small quantities, usually where water is standing, as in sumps. (1 per cent.)

(c) Methane will not support life, and if in sufficient quantity to decrease the oxygen percentage seriously it will suffocate those breathing it. It also will ignite or explode and so is a menace to life. Carbon monoxide will destroy life when inhaled by the lungs, also when ignited or exploded, but if a sufficient quantity to ignite or be exploded is present, death from breathing the gas would be instantaneous. Carbon dioxide is dangerous to life when in sufficient quantity to lower the oxygen percentage in the air below the requisite level. Hydrogen sulphide endangers life when inhaled in small quantities, also when ignited or exploded. (1 per cent.)

(d) Carbon monoxide and hydrogen sulphide are poisonous; methane and carbon dioxide are non-poisonous gases. (½ per cent.)

(e) The combustible gases are methane, carbon monoxide and hydrogen sulphide. The non-combustible gas is carbon dioxide. (½ per cent.)

(f) These gases can all be removed by a properly conducted air current. (1 per cent.)

* Continued from p. 63, *Coal Age*, September, 1941.

Enterprise CARS—fit for the task of Today and Tomorrow

★ Millions of tons of coal must roll from the mines to feed the fires of American Industry to create power to forge the Arms of Defense. ENTERPRISE Mine Cars, built to specific requirements, are standing up under the grind, are helping get out more tonnage faster and keeping down the cost of operation, maintenance and repairs. When next you get Mine Cars . . . investigate the record of ENTERPRISE in actual performance.

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WHAT'S NEW IN OPERATING IDEAS

Battery Boxes Strengthened By Braces and Plates

Although locomotive battery boxes are made of comparatively thin material, they are required to resist the shocks of bumping cars and the inertia of 3 tons of battery. To keep the battery from shifting in the box, it often is wedged in place by cap boards or other convenient scraps of lumber. To strengthen the box so that it can better resist the stresses of traffic and the tendency of the battery to shift, Ernest Prudent, chief electrician, Zeigler No. 1 mine, Bell & Zoller Coal & Mining Co., Zeigler, Ill., has modified it in two respects.

Fig 1. shows two triangular strips welded vertically to the front end of the box, one on either side of the ampere-hour meter. The lower ends of these strips are welded to a third longer strip, tapering at each end, which spans the box and is welded to it. This bracing system stiffens the front end. Fig. 2 shows the rear end of the box braced in like manner. In addition, there are four heavy screws spaced along the upper side of the horizontal strip. These setscrews, bearing against steel plates fastened to the insulating boards, clamp the cells so that they cannot shift longitudinally. One plate, with recesses for the screw ends, and its attached board, is shown in Fig. 3 lying on the floor of the box.

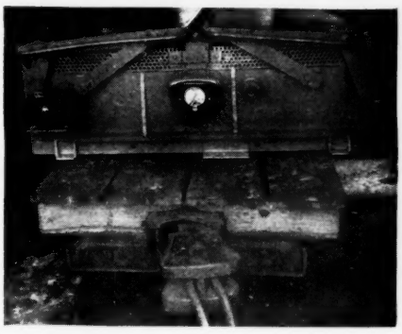

Fig. 1—Front end of locomotive box with three stiffening strips welded on.

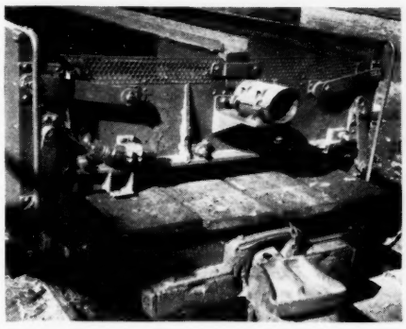

Fig. 2—Rear end of locomotive battery box. Note setscrews for preventing movement of cells in box.

Fig. 3—Clamping plates and insulating boards lying on the bottom of the battery box.

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Castings Stored by Groups In Special Racks

Unfinished brass castings to be made into bearing bushings in the underground machine shop at Willow Grove No. 10 mine, Hanna Coal Co. of Ohio, Neffs, Ohio, are stored in a compact steel rack, where they are segregated in properly identified groups kept definitely apart and yet handy to the reach.

Bushings of a certain size are threaded over a steel rod with a loosely pivoted joint at the back end and with the front end resting in a notch. A label at each notch on the vertical front bars of the rack tells for what purpose the castings on that rod are intended.

A casting is removed by lifting the outer end of the bar with one hand and slipping the casting off with the other. Four machinists work at manufacturing and reclaiming in this underground shop.

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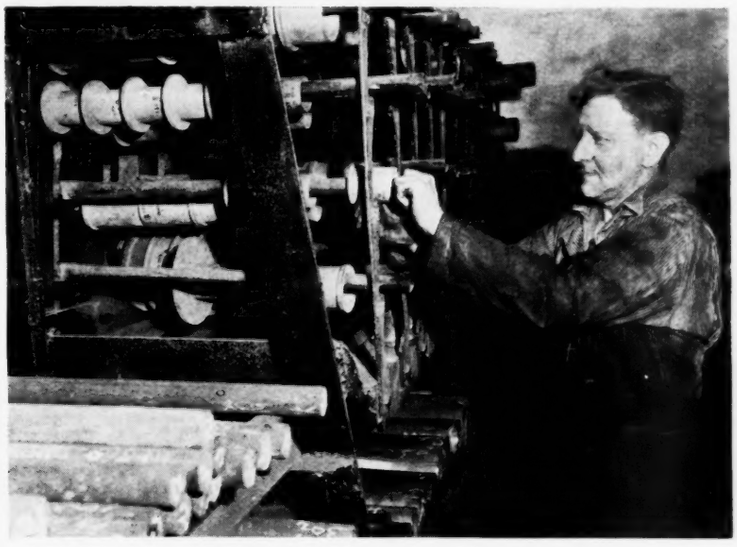
Driving of Ground Rods Eased By Hammer and Anvil Unit

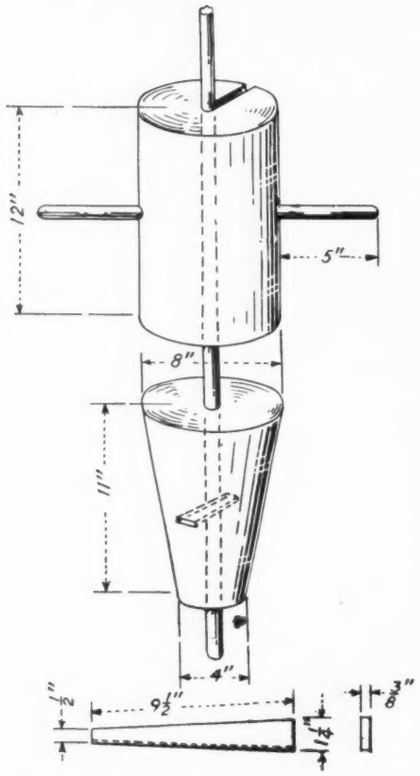
"The job of driving ground rods down to permanently moist earth can be a tedious operation requiring elevated stages or stepladders to get the rods started straight and keep them going in that fashion," writes P. C. Ziemke, Milwaukee, Wis. "The ground rods at our first substation were driven by jackhammers from improvised stages, and while the work was greatly speeded, as compared to using hand sledges, there still was room for improvement. The air drills furnished plenty of power but some difficulty was encountered in preventing the pliable copper rods from whipping or bending, especially when the going got tough.

"On our latest installation, we experimented with a hammer-and-anvil arrangement that showed great promise. Not only did the rods stay straighter but any tendency to deviate from the vertical was instantly noted and corrections made accordingly. The several parts are easy to make in the average mine blacksmith or machine shop. The hammer and anvil are cut from round stock in the power hacksaw. The hammer handles of $\frac{5}{8}$-in. cold-rolled stock are arc-welded to the hammer body. The anvil locking wedge is forged from tool steel to better withstand the abuse of frequent hammering from either end.

"By using this device, no staging or lad-



After a proper casting is selected by the label the rod is lifted and it is pulled off.



Details of hammer and anvil for driving ground rods.

ders are required, since the operator merely locks the anvil on at waist height and then proceeds to drive telling blows with the hammer while an assistant keeps the rod straight. The initial 6 in. or foot of hole are best formed by a crowbar. A little water poured in from time to time often helps in driving."

•

Cutter Chain Safety Device Dropped by Clutch Lever

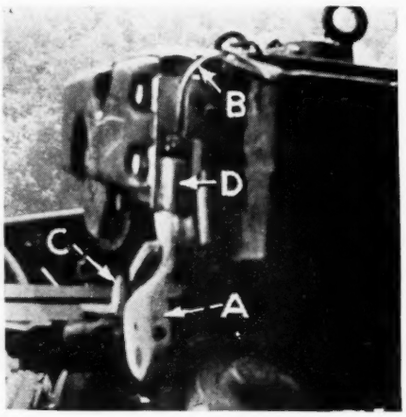
Signaling a departure from the numerous devices which have been applied to mining machines for locking the cutter chains, Harry Caldwell, Koppers Coal Co., Kopperston, W. Va., has devised one which engages and locks the chain automatically when the bit clutch is disengaged. It won for him a $15 cash award as second best among the many entries in the miners' gadget contest at the Southern Appalachian Industrial Exhibition, Bluefield, W. Va., Aug. 21–23.

Moving the clutch lever to stop the cutter chain pulls a flexible cable attached to a pin which in turn releases a dog that drops by gravity to lock the chain. In the illustrations, from snapshots made at the mine, *A* points to the chain-holding dog in its raised or unlocked position. It is pivoted at the lower end on a 9½-in. pin which also holds the sheave block. When the cable *B* is pulled, the dog drops to a position where part of it is between the chain lugs and the end projection is in the slot of anchor bracket *C*. In present practice at the mine, this part *C*, however, is bolted to the main frame under the motor box instead of being welded to the cutter bar. The change was made so that chain adjustments would not move the anchor bracket and affect operation of the locking device.

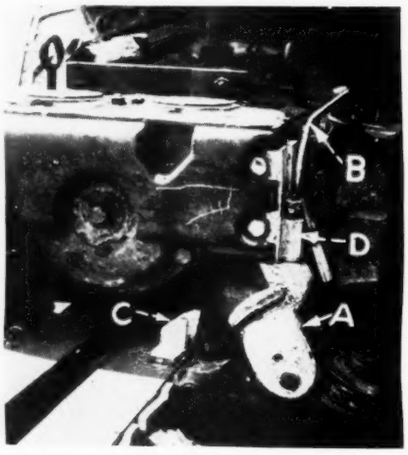
Dog *A*, when locked in its raised position by a spring pin with shoulder, is up under the motor box so as to be clear of the coal when the machine is cutting. This dog is made from bar stock 2 in. thick, cut to a 3½-in. width at the bottom end, to a 6-in. width at the top, and with a 2-in. offset in the center. A hole is provided near the offset for inserting a rod or hook to raise the dog for unlocking and freeing the chain. Reflector buttons fastened on the dog indicate its position.

The shouldered pin is inside of a 1x4-in. tube (*D*) fastened by a bracket made from 2-in. angle iron with one side cut away except that an ear of metal is left at each end. Holes, ⅞-in., in these ears provide for bolting the bracket onto the corner of the motor. A coil compression spring around the pin and inside of the tube holds the pin down to latch the dog positively in the raised position. When the clutch is thrown out, thus automatically pulling the cable, the pin is thereby drawn upward against compression of the spring.

Illustrations show the device on a 35B Jeffrey shortwall, but, according to Mr. Caldwell, it is applicable to several types of cutting machines. He has applied for patents. He also reports that the chief electrician, general mine foreman, assistant mine foreman and safety director of the mine have approved the device.



Side view showing dog pivoted on the same pin that holds the sheave block.



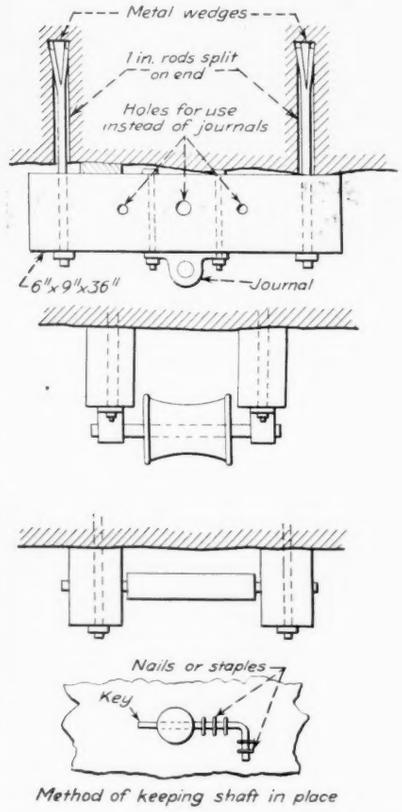
End view with added parts chalked white.

"Mentalnastics"

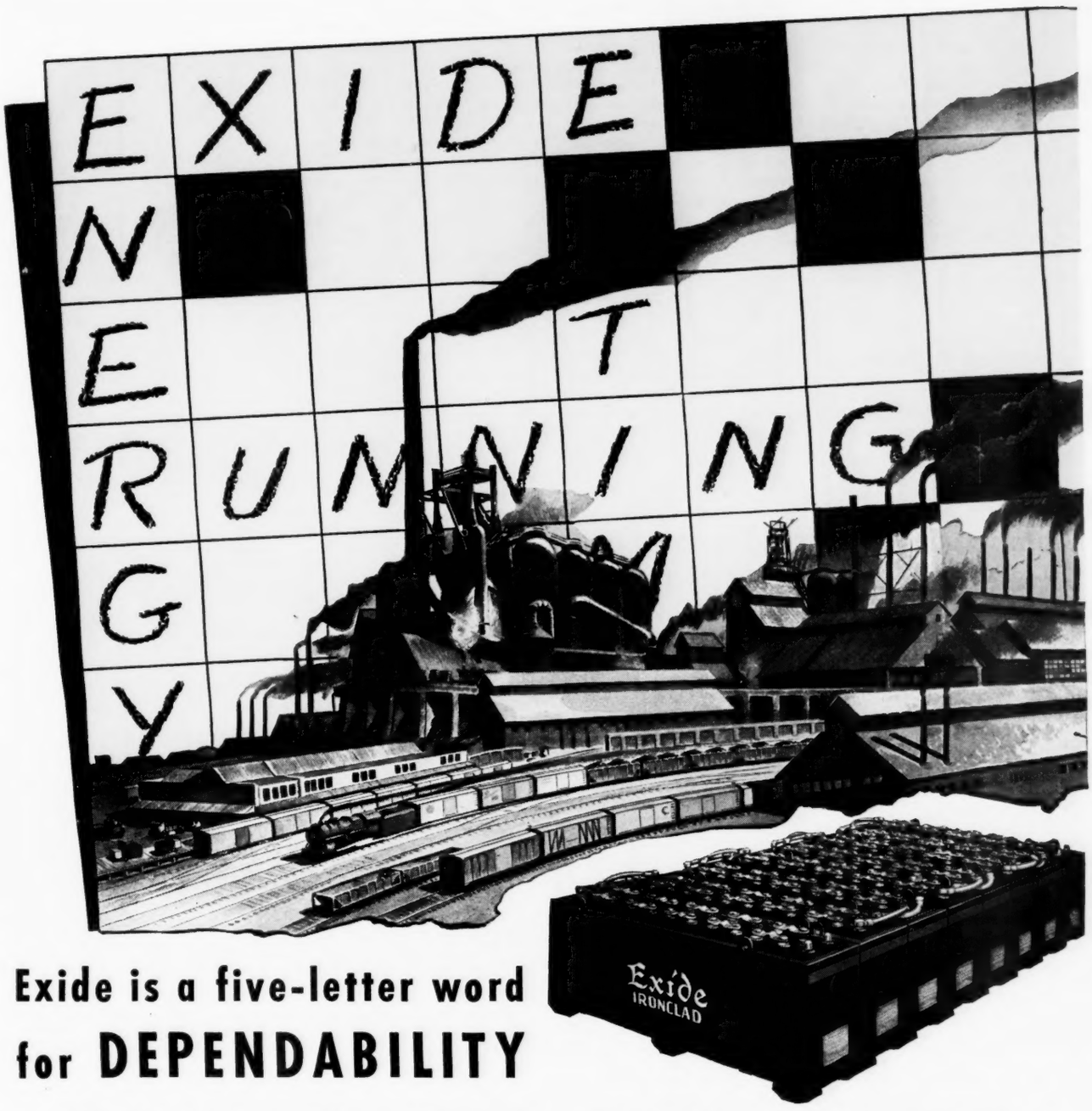
The puzzle section in a certain manufacturer's publication carries the title of "Mentalnastics," meaning, presumably, that successful puzzle solving requires a quick and active brain. The same kind of a brain is a good thing to have around a coal mine, but it also helps to know a few answers in advance. This department's job is to supply some of those answers, and thus help operating, electrical, mechanical and safety men with their on-the-spot thinking. So if you have an idea which you have found helpful in your daily work, here is the place to cash in on it. Send it along, with a sketch or photo if it will help to make it clearer. For each acceptable idea, Coal Age will pay $5 or more on publication.

Rope Haulage Simplified By Roof Brackets

Pointing out that no props or cross timbers are required and the equipment is up on the roof out of the way in case of derailments, Charles W. Watkins, Kingston, Pa., offers the mounting bracket shown in the accompanying illustration for installing wheels or rollers in the roof of slopes used for rope haulage. A feature of the bracket, states Mr. Watkins, is the fact that it can be bored during manufacture with the necessary holes in various locations and diameters to accommodate all types of wheels and pulleys employed, whether mounted in holes in the bracket it-



Details of roller- or wheel-mounting bracket for installation in the roof.



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self or in journals attached to the bottom.

Two holes large enough to take 1-in. rods are drilled near the ends of each 6x9x36-in. bracket for mounting purposes. The rods used in mounting are split at the upper end to permit them to be expanded by metal wedges when driven up into holes bored into the roof. To avoid damage to threads in driving, a block of wood naturally is placed between the end of the rod and the sledge or ax. The bracket then is placed over the threaded ends of the rods and drawn up solidly against the roof by running up the nuts tight enough to prevent twisting, vibration, etc., in operation. Wedges may be used over the bracket to take care of uneven top.

If journals are to be used, they naturally are bolted onto the brackets before they are installed. The anchoring holes in the top should be drilled accurately to correspond with those in the bracket, thus preserving shafting alignment and insuring smooth wheel or roller operation. Depth of the holes naturally will depend upon the type of roof.

The same bracket, as has been stated, may be used with several types of wheels or rollers. Where journals are used, it may be practicable to use the same type as on the mine cars. Instead of rollers or wheels, some coal companies use nothing but a mine-car axle. Adaptability to installation in low places or where the width is limited, and a minimum of labor in erection and maintenance, are other features cited by Mr. Watkins. To hold any straight shafting in place and prevent it, when desired, from turning in bracket holes, Mr. Watkins recommends boring a hole $\frac{9}{16}$ in. or so in the end and then bending a $\frac{1}{2}$- or $\frac{3}{8}$-in. rod as shown in the illustration to make a key. This key is slipped through the hole in the shaft and nailed or stapled to the bracket. In case repairs or replacements are necessary, it is easily removed.

•

Cleaning of Ponds and Disposal of Slurry Solved by Slackline Cableway Excavator

THE PROBLEM of cleaning out ponds and disposing of slurry has been solved at the Staunton (Ill.) operation of the Mt. Olive & Staunton Coal Co. by the installation of a slackline cableway excavator. Two years of washery operation had filled the pond to the point where something had to be done. George Timmerman, top boss, tackled the job by first ordering a McGraw-Hill book, describing, among other things, the Sauerman slackline cableway excavator.

His study resulted in a request for such a rig to remove the accumulated solids. Bucket, carrier, sheave blocks and certain other parts were purchased from Sauerman Bros., Inc. Other parts, including guy and working cables, 14x14-in. fir timbers for masts and a used motor-driven hoist, were obtained from various other sources, while the necessary bridle cables, stretched the full length of the two groups of ponds, were made from discarded 1-in. hoisting ropes. Total cost of the equipment was approximately $3,000.

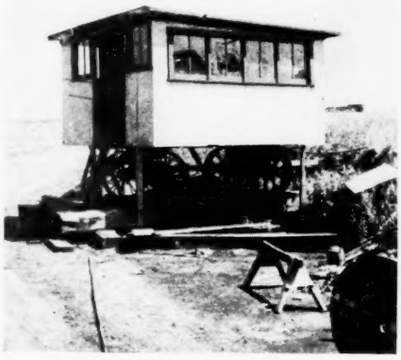
The two masts, one serving three small ponds, as indicated in the accompanying drawing, and the other the one large pond, are 83 and 58 ft. high, respectively. The main, or back, guys are $\frac{5}{8}$-in. and the auxiliary guys are $\frac{3}{4}$-in. ropes. There are three of each size to a mast and they are arranged so that if one should fail the others will be strong enough to hold the load. Provision is made at the top of each mast so that the working cables can freely assume any direction.

Excavator in action, showing tail tower and bridle frame.

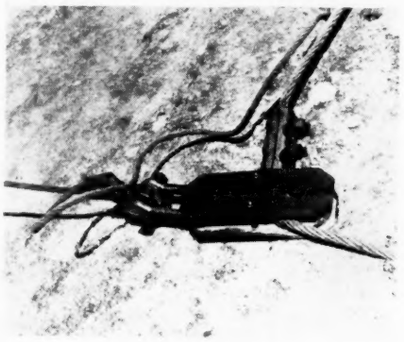
Mast for small ponds, 83 ft. high.

The load and tension cables are each $\frac{1}{2}$-in. ropes, while the track cable is 1-in. The lower, or back, end of the track cable rides in a sheave in a tail tower which supports it a few feet off the ground. The cable then terminates in a bridle shifting frame, which makes it possible to move the back end of the track cable to any desired point along the bridle cable which serves as an anchor. A stop button is clamped on the track cable to dump the bucket at any desired point along the line.

Construction was handled by the top force, following Sauerman instructions. Sauerman standard Timken-bearing sheaves, although more expensive, were found best suited to the work. They are lubricated periodically with a grease gun. The hoist originally was mounted on a wagon with the idea that it would be necessary to do so to service the two masts. However, it was soon discovered that all that was required was to swing the hoist to line up



Hoist house on frame pivoted at the rear.



Bridle-shifting frame.

Bucket and carrier.

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JOHN A. ROEBLING'S SONS COMPANY

TRENTON, NEW JERSEY

Showing 58-ft. mast and movable splashboard for larger pond. The hoist is at the far right.

with the mast in use. So the wagon was mounted on a timber underframe pivoted at the rear on a timber foundation. A jack is used to line up the hoist with either mast in a short time.

The bucket has a capacity of ¾ cu. yd. The quantity of material it will handle depends upon the liquidity of the mixture. Solids accumulate at the rate of about 20 tons per day. The small ponds serve for about 25 operating days and require about four days to clean out.

Slurry is first flooded through a ¼-mm. wedge-wire screen and then goes into the settling tank. A small part of the material into the tank overflows into the pond, while the remainder is passed over a 28-mesh screen, only the through material being flumed to the ponds. At present, solids from the small ponds are deposited on the bank where the water drains off and the mass dries out. It then can be further removed by bulldozer or truck.

Material from the large pond is disposed of directly by truck, into which it is directed by a track-mounted splashboard. Mounting the splashboard on rails permits moving it to any point where it is needed. Thus, a considerable part of the larger pond can be reached in this fashion. Water from all ponds is recirculated to the washer and only make-up water is added from the reservoir. Water supply is thus conserved, an important consideration in dry seasons.

Pyrites and other coarse refuse are trucked directly from the washer to dry ground. Consequently, circulating water does not come in contact with this heavy refuse to leach it out and therefore has an alkaline rather than an acid reaction.

•

Adjustable Spanner Wrench Made From Discarded Parts

The convenience of a monkey wrench is its adaptability to various sizes of nuts. The accompanying illustration shows an adjustable spanner wrench of equal convenience. The design was worked out by James H. Richardson, Harrisburg No. 43 mine, Peabody Coal Co., Harrisburg, Ill., and it was

Discarded parts are used in this adjustable spanner wrench.

built of discarded mining-equipment parts. The bars were forged from the outer races of SKF roller bearings; the hinge from a chain link. The link bushing serves as a hinge for the movable arm, and was welded to the long bar by the arc method.

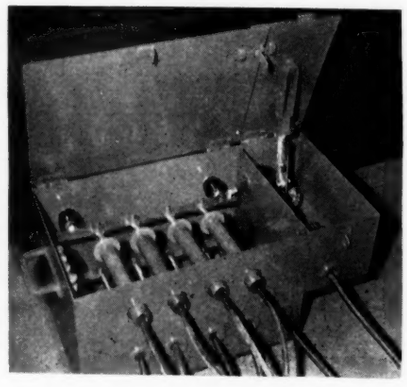
•

Safety Fused Junction Box For Mechanical Mining

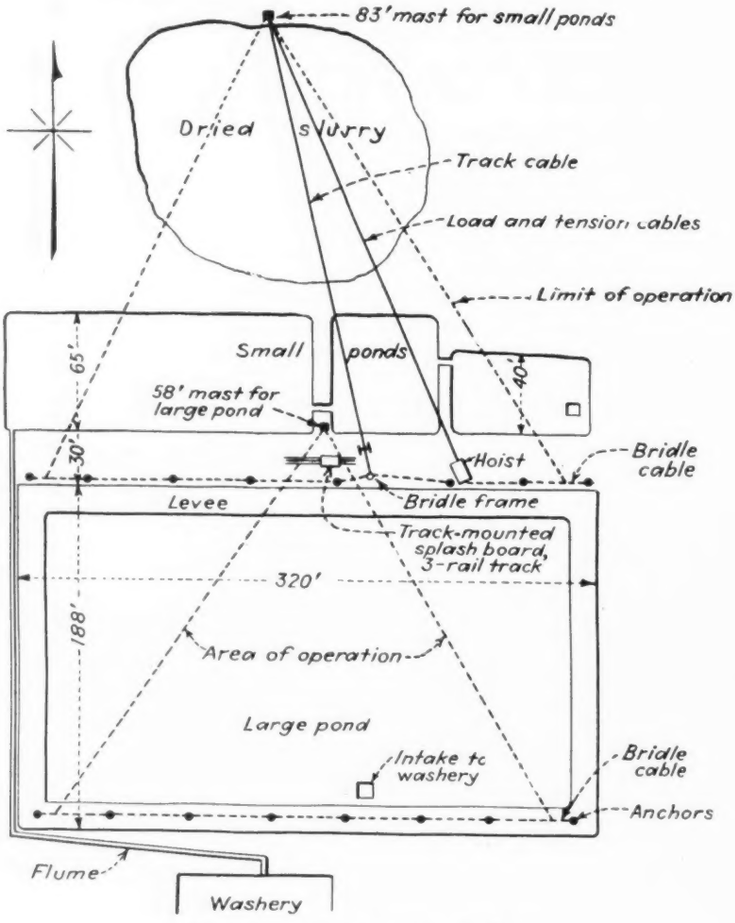
Neither the positive nor negative connections can be disturbed unless the power is off in a safety fused junction box built by H. K. Mundorff, Inland Steel Co., Wheelwright, Ky. This box took the $25 first prize in the "Gadget Contest" at the Southern Appalachian Industrial Exhibition, held at Bluefield, W. Va., in August.

The box has two compartments and the lid also is in two parts. That part of the lid attached to the incoming quick-break switch laps over the other part and thus closes last. A slide rod inside the box, which locks the large compartment lid at its center, extends into the switch compartment and must be pushed into locking position before the switch lid can be closed. Hasps for a padlock complete the closing and locking arrangement.

Two copper buses in the larger compartment each have bolt holes for four take-off taps. Each negative is connected to the lower bus by a knuckle-joint connector, half of which is bolted permanently to the bus. Each positive feeder includes a fused tap with its nip end bolted to the upper bus. Four special tap fuses are kept as spares in a clip inside each box. Both buses are supported on the back of the box by spool insulators such as those used in standard mine hangers. On the lower, or negative, bus, the spools are used for ease and appearance in mounting rather than as insulators.



Fused junction box with lid raised.



Plan of ponds and excavator installation.

WHAT'S NEW IN THE FIELD

Alabama Strike Settled on Basis Of Mediation Board Findings

An agreement to end the strike of 15,000 of the 23,000 idle Alabama coal miners was reached Oct. 24 at a joint conference of operators and officials of the United Mine Workers at Birmingham. The mines were to resume operations on Oct. 27. The settlement was based on findings and recommendations announced in a report by the National Defense Mediation Board on Oct. 22. The agreement does not affect workers in captive mines, who are demanding a closed-shop clause in contracts with three major captive-mine operators. The Mediation Board's report contained four main points:

1. In regard to a request of the U.M.W. that tonnage rates on conveyor loading shall not yield to the worker a lower income than he would earn on a day-rate basis the board recommends that tonnage loading rates on conveyors shall be such as to yield to the worker an opportunity to earn a net income equivalent to what he would earn on a day-rate basis. Computations shall be made semi-monthly. At mines where hand loading and mechanical loading exist, the hand loaders shall be given their share of mine orders and at least given the opportunity to make earnings equal to miners on company work.

2. The section on washed coal covers several pages covering the percentage of coal washed in Alabama as compared with other areas, reasons for washing, cost figures, quantity of refuse, etc. The board recommends that the producers agree during the period of the contract (to March 31, 1943) to absorb a portion of washer loss by payment of 4c. per ton in addition to the regular tonnage rate, to be apportioned between the machine men and loaders.

3. In the matter of vacations with pay the board recommends that provision be made for payment of $20, half in November, 1941, and half on the last pay day immediately preceding Christmas, 1941.

4. Concerning whether Alabama miners should get a further increase above the temporary boost above the basic daily wage it was recommended that the daily rate be raised 25c. as of April 1, 1941, above the temporary agreement. It is further recommended that if experience proves during the term of the contract that the miners and operators are jointly able to reduce production cost, or if the producers are able to obtain a greater realization under any price adjustments than they may have been able to obtain in June, July and August of this year, then an additional 15c. should be awarded to the Alabama miner. It is further provided that there be no further liability on the operators for any daily wage increase beyond the 25c. a day for any part of the year from April 1, 1941, to March 31, 1942, but if a new cost determination is made by the Coal Division at any time prior to April 1, 1943, showing a cost below the estimated total production cost, including the added cost of the adjustment recommended, then the miners shall be given the benefit of that cost reduction up to but not exceeding an additional 15c. per ton.

Keeping Step With Coal Demand

Bituminous Coal Stocks

	Net Tons Sept. 1 1941	P.C. Change From Aug. 1 1941	P.C. Change From Sept. 1 1940
Electric power utilities	10,912	+11.3	— 0.8
Byproduct coke ovens	7,205	+15.9	— 8.0
Steel and rolling mills	775	+ 7.2	+17.2
Railroads (Class 1)	8,111	+15.8	+42.5
Other industrials*	18,032	+12.1	+25.0
Total	45,029	+11.3	+13.7

Bituminous Coal Consumption

	Net Tons Aug. 1941	P.C. Change From July 1941	P.C. Change From Aug. 1940
Electric power utilities	5,646	+ 8.2	+30.0
Byproduct coke ovens	7,108	+ 0.01	+ 6.0
Steel and rolling mills	844	+ 1.3	+ 6.8
Railroads (Class 1)	8,038	+ 3.1	+21.6
Other industrials*	10,767	+ 1.9	+24.7
Total	32,403	+ 2.8	+12.2

* Includes beehive ovens, coal-gas retorts and cement mills.

Coal Production

Bituminous

Month of September, 1941, net tons	45,464,000
P.c. increase over September, 1940	17.63
Jan.-Sept., 1941, net tons	359,816,000
P.c. inc. over Jan.-Sept., 1940	8.01

Anthracite

Month of September, 1941, net tons	5,138,000
P.c. increase over September, 1940	23.15
Jan.-Sept., 1941, net tons	41,016,000
P.c. inc. over Jan.-Sept., 1940	7.04

Sales of Domestic Coal Stokers Vs. Oil Burners

Sales	Coal Stokers	Oil Burners
August, 1941	28,227	20,139
P.c. inc. over August, 1940	22.1	*16.0
January-August, 1941	118,870	130,692
P.c. inc. over Jan.-Aug., 1940	56.0	24.3

* Decrease.

Index of Business Activity*

Latest week	157.6
Per cent change from month ago	+ 2.0
Per cent change from year ago	+17.3

* *Business Week*, Oct. 18.

Electrical Power Outputt

Week ended Oct. 11, kw.-hr.	3,314,952,000
P.c. change from month ago	+ 1.0
P.c. change from year ago	+17.7

† Edison Electric Institute.

Maximum Price Hearing Proceeds; Code Memberships Revoked

Denying motions to dismiss a petition by Luther Harr, Bituminous Coal Consumers' Counsel, requesting establishment of maximum soft-coal prices, Director Howard A. Gray of the Bituminous Coal Division on Oct. 3 ordered the maximum price hearing to be resumed on Oct. 13 at Washington, D. C., which later was deferred to Nov. 4. The hearing, which opened Sept. 9, is being conducted before C. R. Larrabee, chief of the Trial Examiners Branch.

Director Gray stated that it is clear that the Consumers' Counsel has failed to prove allegations in his petition that maximum prices are necessary because "the coal industry is charging excessive and oppressive prices." He said, however, that the evidence did tend to show that the trend of prices has been upward, that there may be a shortage of transportation facilities for the movement of bituminous coal in some localities and that there may be a shortage of certain kinds and sizes of bituminous coal due to the sudden expansion of demand.

Upholding the recommendations of a trial examiner, Director Gray has denied a petition filed by the Consumers' Counsel Division which sought permission for producers in District 8 to sell coal to the Board of Education of the City of Atlanta, Ga., at minimum prices for industrial coals. The examiner, Floyd McGown, who conducted a public hearing in the matter, pointed out in his report that the Division ruled in a previous case that coal sold for use in heating schools does not come within the definition of industrial coals. He stressed that under the Division's ruling minimum prices for industrial coals apply only to certain types of coals used for processing or for creating energy. Minimum prices for domestic coals apply to those shipped for all other purposes.

The Division denied a request by the West Virginia Coal & Transportation Co., St. Paul, Minn., for establishment of minimum prices for f.a.s. delivery of certain sizes of District 8 coals to the Northern States Power Co., St. Paul and Minneapolis, via Ohio and Mississippi river barges. The coal company contends that because of recent Mississippi River navigation improvements which permit barge shipments from its West Virginia mines to the Twin Cities during part of the year it now is eligible to sell river-transported coal to the power company at minimum prices for f.a.s. delivery. It further pointed out that Illinois producers have been authorized to sell river-transported coal to the power company at minimum f.a.s. prices, and that District 8 producers would be given the same privileges.

In the Director's opinion the coal producers failed to show, as required to obtain f.a.s. prices, that under conditions pro-

vided by the new navigation improvements the power company would have customarily purchased District 8 river coal to the exclusion of other comparable coals shipped by rail, truck or via the Great Lakes docks. Nor was there a satisfacory showing that the power company would have regularly purchased the river coal at a savings from available prices of comparable coals moving by other methods. The power company's plant does not adjoin river dock facilities, and barge shipments to it are classed as ex-river in that the shipments can be made only part of the way from mine to plant via barge.

Another motion denied by the Division was one by District 15 Board, Kansas City, Mo., seeking to withdraw a compliance complaint it had filed against the Pittsburg & Midway Coal Mining Co., Pittsburg, Kan. The board alleged the company violated the Coal Act and regulations. The Division order stated that good cause had not been shown for withdrawal and that it appears that proper administration of the Coal Act requires that a hearing be held

Plea by the Truax-Traer Coal Co. for a reduction of 10c. a ton in the minimum price of its Dorothy seam coal, mined in southern West Virginia, was denied. Division officials stated that testimony at a hearing did not substantiate the producer's contention that a reduction in price was necessary to prevent displacement of its coal by Hazard No. 6 coal from eastern Kentucky.

Revocation of code memberships of the following companies has been ordered by the Division for wilful violation of the Coal Act and regulations: V. & M. Coal Co., Youngstown, Ohio; W. C. Thomas and L. Payne (a partnership), Cranes Nest, Va.; Pittsburgh & Shawmut Coal Co., Kittaning, Pa.; C. E. Houghton, Hamilton, Iowa; B. B. B. Coal Co., near Hamilton, Iowa; E. M. Leeper, Unionville, Mo.; R. B. Rowland, Livonia, Mo., and M. K. & K. Coal Co., Hamilton, Iowa.

A hearing revealed that the V. & M. company, operating a truck mine in Mahoning County, Ohio, sold coal below minimum prices and failed to file with the Division required data concerning sales transactions. Taxes totaling $382.61 must be paid as a condition of restoring membership.

The Pittsburgh & Shawmut suspension is for 180 days, and the company has agreed to repay $5,835 to 22 producers from which it admitted having collected unauthorized discounts from minimum prices in purchasing coal for resale in transactions where discounts are not allowed.

The others sold coal below minimum prices and must pay the following taxes: C. E. Houghton, $119.27; B. B. B. company, $267.87; E. M. Leeper, $150.69; R. B. Rowland, $514.43, and M. K. & K. $161.61.

A cease and desist order has been issued restraining the Coryell Coal Co., Hayden, Colo., from further violations.

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All-Steel Tipple for Schuyler

Schuyler Coal Corporation, Rushville, Ill., has completed a new all-steel tipple equipped with fire-fighting devices. In addition, a contract for a washery for stoker coal has been placed. The tipple was built by Link-Belt Co. at a cost of $100,000.

Expense-Cutting Maintenance Ideas Expounded To Mining Electric Group

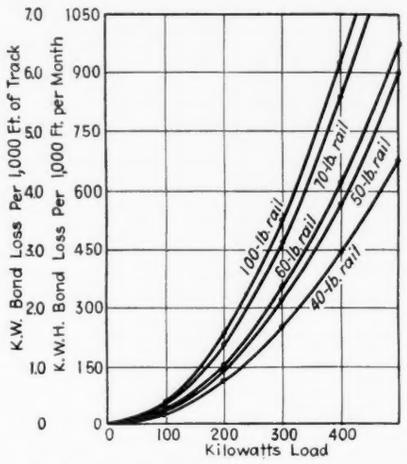
INEXPENSIVE maintenance begins with sound construction. If a job can be made absolutely permanent, maintenance is nil. That was the gist of W. Hartley Wilson's claim for bronze welded track joints, as set forth at the Oct. 3 meeting of the Southern Illinois Mining Electric Group at the West Frankfort (Ill.) Country Club. Mr. Wilson represents the Air Reduction Sales Co.

Furthermore, bronze welded track joints save power because they have 100 per cent electric conductivity, said Mr. Wilson. Other good reasons for welded as against bonded tracks are: They are safer, cheaper and reduce armature burn-outs and maintenance on rolling stock. He gave first cost of bronze welded joints and bonded joints as $1.25 and $1.50, adding it will vary with conditions and labor rates. Data in the accompanying table are the basis for the kilowatt bond loss curves shown herewith. It must be remembered that resistance losses are as the square of the current flowing, so total losses pyramid rapidly as loads increase.

Usual bronze welding practice, according to the speaker, is to "V" the ball of the rail and to weld the entire cross-section. This results in a joint with tensile strength of 60,000 lb. per square inch and having ductility sufficient to resist shocks and prevent rail breakage. Fishplates are not used on bronze welded joints. The most economical way to butt-weld rail ends is to use bronze welding rod and Marvel flux with the oxyacetylene torch.

A subject new to the southern Illinois area, which may be of growing importance to the mining industry—flame hardening of steels—was touched on by Mr. Wilson. Essentially, the process consists of rapidly raising the treated surface above critical temperature and immediately quenching before heat can reach the interior of the piece treated. The depth of hardening may be from a few thousands to ¼ in. With deep hardening there is danger of decarburization; the object is to make the hardened surface abrasive- and wear-resisting with a minimum of distortion.

This method of hardening may be applied to steel or cast iron after heat treatment



Mine-track bond losses based on 4/0 copper arc-welded bonds; 250 volts on trolley and 150 hours' operation a month.

or without heat treatment. It causes little or no distortion such as furnace treatment causes. The hardened surface may be refinished by grinding if exactness is required. Normalizing should precede flame hardening. Flat or round shapes may be treated. While a wide range of carbon steels may be flame-hardened, the best range is from 200 to 400 Brinell, on a rough average—with considerable increase in range for certain carbon-content steels. The degree of hardness depends on the chemical analysis of the metal treated.

Treatment may be applied to areas so wide that several passes must be made, and to round parts so long that a progressive treatment, like cutting a thread, must be used. An interesting feature is that quenching follows so closely that the quench spray often is incorporated in the flame head and is but ½ in. behind the flame. Size of burner tip is important, as also is the speed of the work. A wide range of speeds was suggested on various types of work: For spiral treatment, like cutting a screw, 3 to 10 in. a minute; for small round work with narrow threaded bands, 100 r.p.m., after which it should be dropped in a bath.

Technique differs for various shapes and

Electrical Losses in Mine Rail Bonds

Rail Weight, Pounds Per Yd.	Bonded Track, Ohm per 1,000 Ft.	Welded Track, Ohm per 1,000 Ft.	Efficiency of Bonded Joints, Per Cent	Kw. Load at 250 Volts	Kw. Bond Loss per 1,000 Ft.	Kw. Loss per Month,* 1,000 Ft.
40	0.01365	0.0125	91.6	100	.18	27
				200	.74	111
				300	1.66	249
				400	2.94	441
50	0.01148	0.0100	87.3	100	.24	36
				200	.95	142
				300	2.13	319
				400	3.79	578
60	0.00996	0.00835	83.9	100	.26	39
				200	1.03	154
				300	2.32	348
				400	4.12	618
70	0.00933	0.00715	76.6	100	.35	52
				200	1.39	209
				300	3.14	421
				400	5.58	837
100	0.00741	0.00500	67.5	100	.39	58
				200	1.54	231
				300	3.47	520
				400	6.16	924

* 150 hours operation per month.

It used to jiggle papers off desks two floors away

A typical example of Goodrich development in rubber

ONE punch by this 15-ton giant and a flat piece of steel becomes a vacuum cleaner frame. But the crunching force of that giant blow shook the whole factory building. Floors and walls quivered—vibration was so bad that papers jiggled off desks two floors above.

Owner of the press heard that B. F. Goodrich engineers had developed a way to "float" big machines in rubber just as automobile engines are floated for smoothness. Could soft, flexible rubber handle anything as huge as this without letting it sway and topple?

Goodrich engineers studied the operation, developed a novel solution—mount the press on the rubber floats (they call them "Vibro-Insulators") to absorb downward thrust and "tie" it to the ceiling in the same way to prevent side sway.

It worked like a charm. Now every jar of the press in any direction is absorbed by the rubber instead of being passed on to the floor and ceiling of the building. Walls are safer, efficiency of workmen is higher because the noise and annoyance of vibration are ended.

A few small rubber parts made a big difference in this plant. B. F. Goodrich makes 32,000 items of rubber. It's almost sure that some of them could improve some of your operations. Certainly it's worth a phone call to your B. F. Goodrich distributor to find out. *The B. F. Goodrich Company, Mechanical Goods Division, Akron, Ohio.*

B.F. Goodrich

First IN RUBBER

(Another story of Goodrich development work appears on page 1)

sizes of materials to be treated. Usually a trial run must develop the details. An acetylene burner of large gas volume is used so that surface heating may be greatly accelerated—this is to keep the core of the treated piece from receiving appreciable heat. Quenching usually is with water of ordinary tap temperature. Parts stored out of doors in cold weather should be taken indoors and acclimated before being flame-hardened.

These processes, said Mr. Wilson, are quite within the skill of most mine mechanics and the usual well-equipped shop. Among the practical applications mentioned were hardening rail ends to prevent wheel batter; armature shafts and automobile parts. Gears came in for much discussion because of the importance of reducing wear.

New officers were elected by the group as follows: president, Frank Eubanks, Old Ben Coal Corporation; vice president, Hector Hall, Bell & Zoller Coal & Mining Co.; secretary, H. G. Westerland, Chicago, Wilmington & Franklin Coal Co.; treasurer, Guy Biby, Franklin County Coal Corporation.

•

Priority Rating Granted To Anthracite Laboratory

Anthracite Industries Laboratory, Primos, Pa., has been granted an A-2 preference rating by the Priorities Division of OPM, to be used for a continuation of its present operation. OPM believes this rating will be sufficiently high to enable a research laboratory to obtain all the materials it needs for this type of work.

As the laboratory is now engaged in an extensive study of ways and means to replace any serious shortage of domestic oil with anthracite and is cooperating with various defense housing and other governmental agencies in several other projects, this priority rating gives assurance of uninterrupted support to national defense.

•

Sipsey Mine to Be Rehabilitated, Reequipped and Reopened

Sipsey mine, in Walker County, Alabama, which has been idle since February, 1931, is to be rehabilitated and reopened by the DeBardeleben Coal Corporation in a move to meet substantially increased coal requirements of Southern defense industries. The mine, which is on the Warrior River, will produce 30,000 tons of coal monthly and provide employment for 400 miners.

Construction of a new tipple and washer and installation of the most modern mechanical equipment at the operation will involve expenditure of about $200,000. Coal reserves are adequate, it is estimated, to permit operations for 30 years at the planned production rate. Until the rehabilitation work is completed, about March 1, 1942, mine run coal will be switched 3 miles by rail from the Sipsey mine for preparation through the Empire mine facilities.

Henry T. DeBardeleben, president of the DeBardeleben Coal Corporation, said reopening of the Sipsey mine would "step up our coal production to approximately 1,250,000 tons per annum."

Central West Virginia Institute Holds First-of-Season Meet

With over 100 in attendance, the Central West Virginia Coal Mining Institute held the first meeting of its 1941-42 season at the High School Auditorium, Webster Springs, W. Va., the evening of Oct. 10. Showing of the Joy Mfg. Co.'s movie on mechanical loading into conveyors and shuttle cars was followed by a forum on mechanical mining conducted in question-and-answer form.

The proceedings were conducted by J. H. Nuzum, superintendent, McCandlish mine, Hutchinson Coal Co., Meadowbrook, W. Va. Representing Joy and the principal targets of the questions were D. T. Lucas and Wilfred Rose. Chief interest was centered on shuttle-car performance and the possible use of such equipment on heavy grades. At No. 25 mine of the Consolidation Coal Co., Clarksburg, W. Va., operating in the Pittsburgh seam, reported O. F. Allen, superintendent, the average output over 30 days of a loading machine served by mine cars was 201 cars per shift. Loaders served by shuttle cars, on the other hand, averaged 478 cars. Over 1,000,000 tons has been produced since March 23, 1939, when mechanization was started at the mine, serving as a laboratory for the West Virginia division, including some 65,000 to 70,000 tons from a track unit which went into service last April.

Supplementing the general discussion were remarks from a number of men introduced by the chairman, including F. K. Day, general superintendent, Pardee & Curtin Lumber Co., Bergoo; M. J. McAndrew, superintendent, Dawson Coal Co., Clarksburg; C. W. Thompson, superintendent, and R. K. Buzzard, assistant, Bergoo No. 2 mine; Kenneth Williams, State mine inspector for Webster County; Glenn J. R. Toothman, mining engineer, Fairmont Division, Hutchinson Coal Co., Hepzibah; and H. R. Hall, superintendent, Glady Sewell Coal Co.

After-meeting confab is interrupted to pose for the Coal Age camera. Shown (left to right) are Glenn J. R. Toothman, F. K. Day, O. F. Allen, Wilfred Rose, D. T. Lucas and J. H. Nuzum.

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Anthracite Dues Revolt Ended; District Charter Revoked

The revolt against increased union dues and assessments which kept about 20,000 Pennsylvania anthracite miners idle for 26 days in District 7 of the United Mine Workers ended on Oct. 4 when leaders of the insurrection said they would not try to thwart the expressed desire of a majority of the strikers to return to work. Of the 40 active locals in the district, 32 voted on Oct. 3 to return to the mines Oct. 6.

Garrett Miller, of Nesquehoning, leader of the revolt, asserted at a mass meeting that the insurgents had gained a partial victory, adding that Evan Evans, general manager of the Lehigh Navigation Coal Co. and spokesman for the operators, had assured him that the employers would not check off more than $2 a year in international assessments until the new $6-a-year assessment plan was approved by the employees. The complaint against the increase in dues from $12 a year to $18, Mr. Miller said, would be taken up by a commission of the international union.

The charter of District 7 was revoked and all but one member of the district staff were removed from office on Oct. 9 by John L. Lewis, U.M.W. president. A provisional government was established by order of the union head to manage the affairs of the district until the international executive board sees fit to restore autonomy to the district and permit an election of officers. The constitution and bylaws of the district were suspended to give the provisional commission full power over the area.

Officers ousted by the order were: Hugh V. Brown, president of the district; Peter Flyzik, vice president; John Yourishin, secretary-treasurer; six members of the district executive board, three tellers, three auditors, five district field workers, and four of the five international field workers.

Part of the 100-man (plus one boy) attendance at Webster Springs.

In these days . . .

would you buy a gasoline that would give you twice the mileage and power—?

Yes—and you would be glad to pay a premium price for it, too.

The same logic would apply to wire rope—and in that connection we offer—

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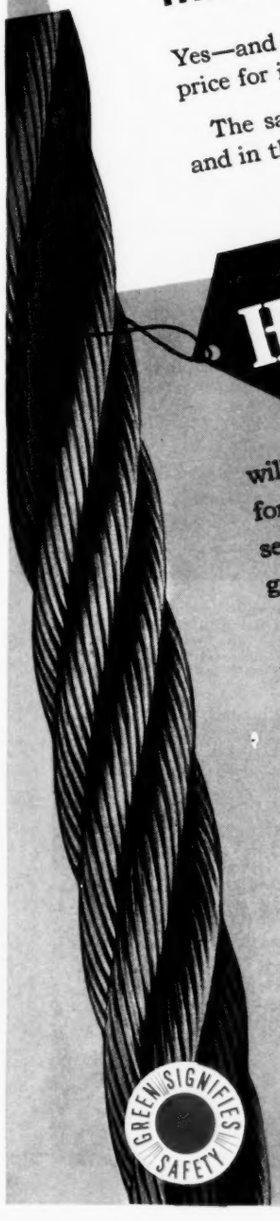

● *Invariably*, Hazard LAY-SET Preformed will give far better and longer service, when compared with non-preformed rope. In many instances it has given much more than twice the service. The result is fewer machine shutdowns, steadier production, greater efficiency.

It is the preforming process which LAY-SET goes through at the mill that makes possible this superior service. Preforming relaxes the wires—relieves them of pent-up stresses—gives the rope extreme resistance to bending fatigue. It makes LAY-SET resist kinking and twisting; makes it easier, faster and safer to handle. It obviates the necessity for seizing the ends when being cut.

For longer and better rope service, for less "outage time" for machines and men, for greater safety to workmen—specify Hazard LAY-SET Preformed. All Hazard ropes identified by the Green Strand are made of Improved Plow Steel.

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Southern Operators Organize For Separate Bargaining

Coal operators of 13 Southern associations banded together in corporate status Oct. 18 to perpetuate the aims which led to their withdrawal from the Appalachian wage conference during the contract negotiations last spring with the United Mine Workers. Southern Coal Producers, Inc., was chartered by the West Virginia Secretary of State as a non-profit concern with headquarters in Washington, D. C.

L. Ebersole Gaines, president, New River Co., who presided at a meeting Oct. 20 in Cincinnati, Ohio, said: "We have no argument with the U.M.W. That matter has been settled." Election of officers was deferred for a second meeting to be held in Cincinnati in the near future.

Objectives of the new organization, it was explained, will be to bargain collectively and promote the interests of Southern producers as they are affected by markets, freight rates and the like. Organization of the new group came in the face of a notice from a union spokesman that the U.M.W. would continue to bargain with the Appalachian conference, with which the basic agreement of last spring was signed.

For purposes of the corporation the Pocahontas-Tug River district will be considered as separate units. The directorate will be made up of one member from each of the 14 districts, a director-at-large and additional directors elected on the basis of tonnage. For each 10,000 tons or fraction thereof produced annually the district will be entitled to one additional director.

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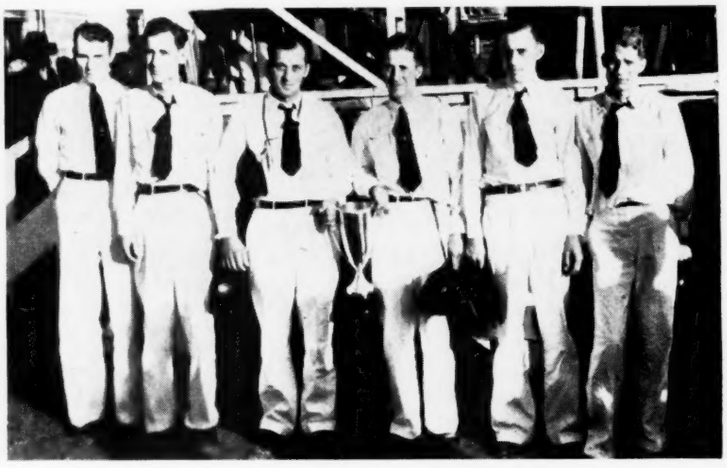
Consolidation Teams Shine At Joint Safety Meet

With free outdoor shows by entertainers from broadcasting station WLW, Cincinnati, the Sept. 27 mine-rescue and first-aid contest at Pikeville, Ky., was made a gala day. At this meet, sponsored by the Big Sandy-Elkhorn Coal Mining Institute and the Pond Creek-Tug River Mining Institute, $1,285 in cash prizes was given to 34 contesting teams and at the end of the day to lucky ticket holders were given a Buick car and two U. S. Government defense bonds.

High honors of the day and first in the Big Sandy-Elkhorn group went to a Consolidation Coal Co. first-aid team from Mine 206, captained by Blaine Sexton. Second in the group went to another team from the same company, captained by John Hill. Judged best from the Pond Creek-Tug River district was the Leckie Collieries team captained by Julius Kennedy. In the colored first-aid contest a Consolidation Coal Co. team from Mine 214, captained by J. W. Moss, won. In addition to cash and loving cups those four teams won all-expenses-paid trips to the State-wide contest at Lexington a week later, where the Mine 206 and Mine 214 teams proved their claims as the best trained white and colored teams in Kentucky. Their photograpins, taken at Lexington, are shown herewith.

In the morning three mine-rescue teams competed for cash prizes of $150, $100 and $75. These teams and their captains, listed in the order of their winnings were: Inland Steel Co., Willie Rainey; Consolidation Coal Co., John Hill; and Eastern Coal Corporation, John Coyer. A minimum of $20 cash was given to each competing first-aid team in the white and colored men's classes. Each boys' and girls' team received $12 to $20.

The meet was held in the City Park, which



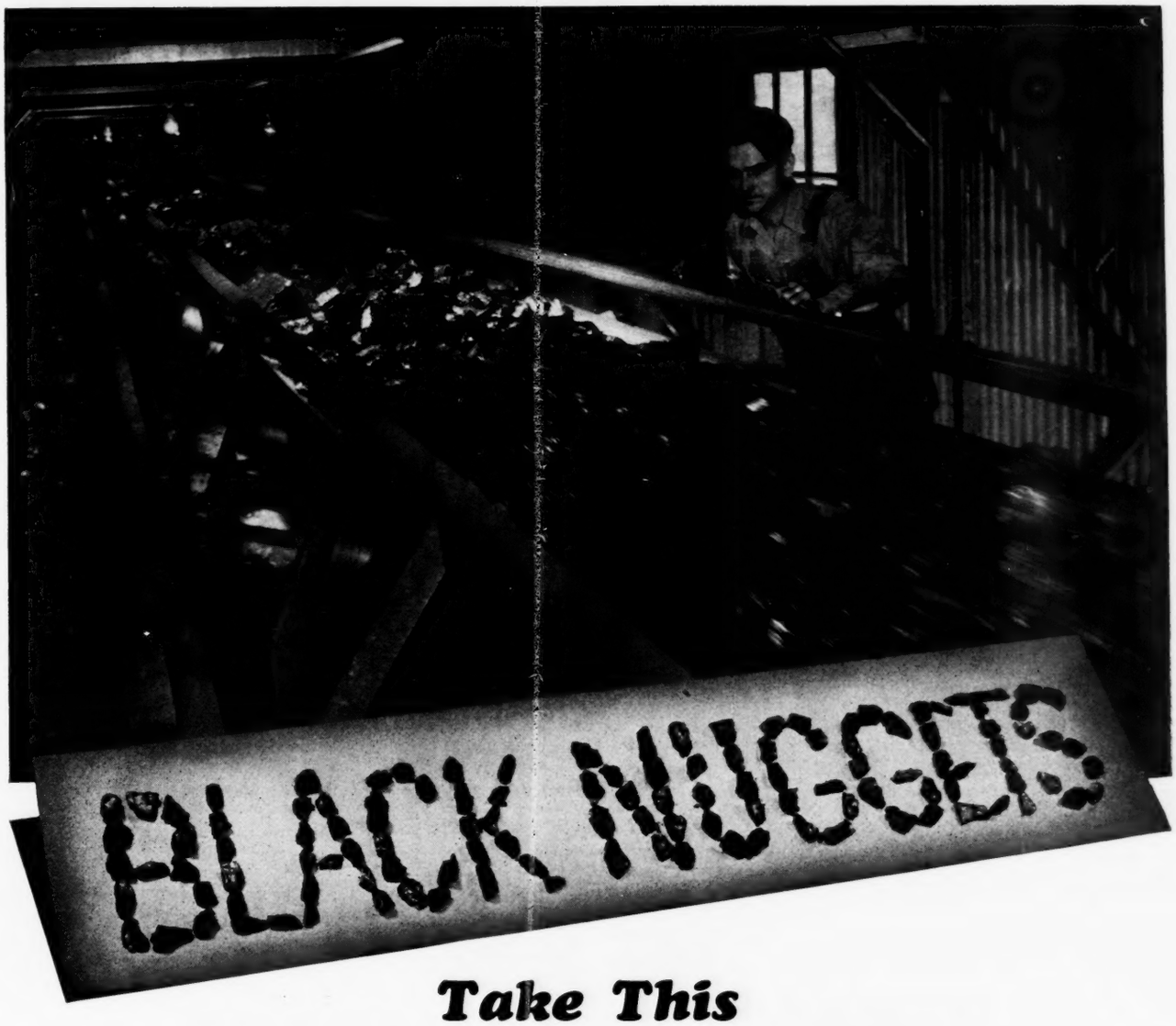
Pond Creek-Tug River cup winner.

First-aid team of the Leckie Collieries Co., Aflex, Ky., holding the cup presented by the Operators Association of the Williamson field. Left to right: Raymond Brown, Ramon Patts, Julius Kennedy (captain), Anthony Macchavernia, Lowell Bassham and Hurstie Reed.

Won the mine-rescue contest at Pikeville.

Team from Inland Steel Co., Wheelwright, Ky. Left to right: John Paul Hensley, L. H. Alley, Oscar Bradford, Howard Holbrook, George Foster and Willie Rainey, captain.

First-aid problem in the City Park at Pikeville.



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In many mines today, Conveyor Belts built by U. S. Rubber are speeding pay loads from face to tipple safely, surely, economically. U. S. Rubber Engineers are cooperating with both mine owners and builders of conveyor belt systems to provide U. S. Belts that give Service Beyond Price and Specifications on each individual assignment.

These men will be glad to consult with you on your problems.

SERVICE BEYOND PRICE AND SPECIFICATIONS

United States Rubber Company

Rockefeller Center, New York, N. Y.

is adjacent to the business district. Speakers were Hi Pauley, Mayor of the city; F. M. Correll, president of the Big Sandy-Elkhorn institute; and G. E. Minns, president of the Pond Creek-Tug River institute. Mr. Minns stressed safety from the standpoint of national defense—keeping every man at work full time to help production. Members of the executive committee for the meet were: F. M. Correll, G. E. Minns, A. D. Sisk and G. M. Patterson. The latter, who is chief of the Kentucky Department of Mines and Minerals, was also director of the meet.

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H. S. Salmon Dies Suddenly

Herbert S. Salmon, 53, well known mining and industrial engineer, died Oct. 14 at his home in Birmingham, Ala., after a brief illness. A native of Frankfort, Ind., and educated at Purdue University, he went to Birmingham in 1907 and was connected with the Tennessee Coal, Iron & Railroad Co. for 15 years, becoming chief mining engineer for the Woodward Iron Co. in 1922. In 1924 he became a member of the firm of Salmon & Cowin, Inc., mining and industrial engineers, which connection he retained at his death. He was chairman of District 13 Bituminous Coal Producers' Board and also was president of Alabama Coals, Inc., positions he had held since the organization of these bodies.

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Obituary

EDGAR ADLER, 70, prominent in the Alabama coal industry for a number of years, died suddenly Oct. 9 of a heart attack at his Birmingham residence. He had been connected with the old Tutwiler Coal & Coke Co. and later with the Corona Coal & Iron Co., which was absorbed by the DeBardeleben Coal Corporation in 1922.

WARD BRANNON, 48, district sales manager for the Ohio Brass Co. at Middlesboro, Ky., for the last 15 years, died there after a brief illness on Sept. 23. Previous to his association with Ohio Brass he had been connected with the Fairmont Supply Co. and was well known to mining men in Kentucky, West Virginia and Tennessee.

WILLIAM J. BEURY, 64, president, Algoma Coal & Coke Co., Algoma, W. Va., died Oct. 24 in a Philadelphia hospital, where he had undergone a surgical operation. A graduate of the Hill School, Pottstown, Pa., and Roanoke College, Salem, Va., he became scrip clerk for the Algoma organization 43 years ago and rose to the presidency in 1918. He also was interested in a number of operating coal companies in the Pocahontas and New River fields and in land-holding companies in Kentucky and the New River field.

WILLIAM E. MILLER, president of the Baker-Whitely Coal Co., operating in Somerset County, Pennsylvania, died Oct. 22 in Baltimore after an illness of eight months. Joining the Baker-Whitely firm as an office boy 57 years ago, he became its president in 1929. He also was president of the Somerset County Coal Operators' Association.

Blank & Stoller

J. Noble Snider

J. Noble Snider Directs Plans For Cincinnati Convention

J. Noble Snider, vice president, Consolidation Coal Co., has accepted the chairmanship of the national program committee of the nineteenth Annual Coal Convention and Exposition of the American Mining Congress, to be held April 27-May 1, 1942, at the Music Hall, Cincinnati, Ohio.

Meantime, under the direction of Mr. Snider, industry committees representing the various coal-producing states and districts are holding meetings to prepare a program that will include discussions of all phases of coal-mine operation, with particular reference to coal's position in the national defense program. Included in these committee discussions are questions of mechanical loading, conveyor mining, priorities for mining equipment, equipment maintenance, safety and mine ventilation. The committee is receiving recommendations by ballot on subjects for consideration by speakers at the convention.

State chairmen of program committees are:

Pennsylvania, Bituminous—Frank B. Dunbar, manager, Mather Collieries.

Pennsylvania, Anthracite—R. E. Hobart, mechanical superintendent, Lehigh Navigation Coal Co.

Ohio—S. W. Blakslee, general manager, Powhatan Mining Co.

West Virginia—Carl Scholz, consulting engineer, Carbon Fuel Co.

Virginia—Walter C. Shunk, president, Peerless Coal Corporation.

Kentucky—W. J. Borries, general manager, Dawson-Daylight Coal Co.

Tennessee—Stanlee Hampton, vice president, Tennessee Consolidated Coal Co.

Alabama—Roy Ratliff, general manager, Sloss-Sheffield Steel & Iron Co.

Illinois—Fred A. Miller, assistant vice president, Franklin County Coal Corporation.

Indiana—H. P. Smith, general manager, Princeton Mining Co.

West Central—A. E. Marriott, president, Marriott-Reed Coal Co.

Rocky Mountain—George B. Pryde, vice president, Union Pacific Coal Co.

Strip Mining—William L. Burt, vice president, Jefferson Co.

Priorities Coordinator for Mines Named: W. A. Nelson

Wilbur A. Nelson, head of the Corcoran and Rogers School of Geology at the University of Virginia since 1925, has been appointed Priorities Coordinator for Mines under OPM. Born in Nashville, Tenn., Feb. 14, 1889, he was educated at Vanderbilt and Stanford universities. He has worked as a chemist for the Tennessee Packing Co.; assistant geologist, Tennessee Geological Survey; economic geologist for the Nickel Plate Ry.; mining geologist, Paga Mining Co., Cartersville, Ga.; and also has been a member of the Tennessee Highway Commission; State geologist of Tennessee; State geologist of Virginia. He is a former president of the American Association of State Geologists and was president of the Tennessee Academy of Sciences in 1924. He has been granted leave of absence by the University of Virginia to take up his new duties.

D. L. McElroy, director of the West Virginia University School of Mines, has been given temporary leave of absence to serve as Assistant Coordinator for Mines.

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Personal Notes

C. A. CARMAN, who has served as instructor in the Mining Extension Department of the West Virginia University School of Mines in the Montgomery district since 1937, has resigned that position to become mine foreman at No. 4 mine of the Koppers Coal Co., Kimberly, W. Va.

OWEN W. COX, president, Laurel Smokeless Coal Co., was elected president of the New River Coal Operators' Association at its annual meeting, Oct. 15. Other officers named were: vice president, EDWARD GRAFF, vice president in charge of operations, New River Co.; secretary, STANLEY C. HIGGINS; treasurer, P. M. SNYDER.

RICHARD H. DALRYMPLE, of Moab, has been named chief coal-mine inspector for the Utah State Industrial Commission, vice JOHN TAYLOR, released several weeks ago. The new inspector is a graduate in mining engineering of the Oklahoma School of Mines. He has worked as mine surveyor, engineer, safety inspector, foreman and superintendent in various Utah and New Mexico mines, and also has operated his own coal-mining company. He holds a Utah mine foreman certificate. He was a Democratic member of the Utah House of Representatives during the last term.

FRED A. HUFF has been appointed superintendent of the Burning Star mine of the Truax-Traer Coal Co., DeSoto, Ill.

MARCUS KERR, chief of the Ohio Division of Mines, resigned on Oct. 7 and was reappointed by Governor John W. Bricker for a term of six years.

HARRY LA VIERS, vice president, South-East Coal Co., was reelected president of the Big Sandy-Elkhorn Coal Operators' Association at its annual meeting, Oct. 15. All the other officers were renamed, as follows: vice president, L. C. CAMPBELL,

"GULF Engineering Service is helping increase our output in three ways"

— says this Superintendent

"WHEN I called in a Gulf engineer recently, I knew we would secure sound lubrication recommendations," says this superintendent. "But I didn't expect Gulf Engineering Service to help us in so *many* ways. Look what we're getting: (1) Improved lubrication, (2) Improved equipment performance, (3) Reduced 'down-time'—and these all add up to a *considerable boost in output!*"

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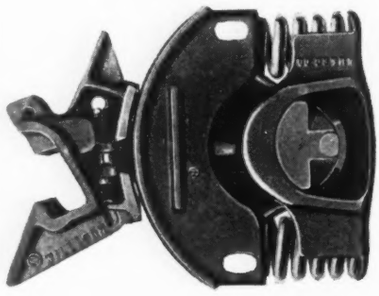
SAFETY and EFFICIENCY IN MECHANIZED MINING } *Means* **WILLISON AUTOMATIC COUPLERS**

. . . for your new high capacity mine cars and locomotives



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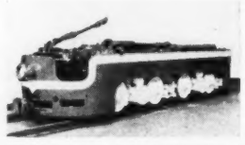

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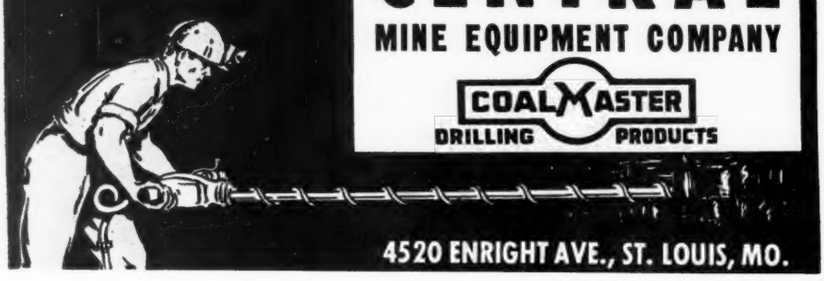


4520 ENRIGHT AVE., ST. LOUIS, MO.

assistant to vice president, Koppers Coal Co.; secretary, H. S. HOMAN; treasurer, H. H. KUHLING.

W. C. MILLER, general manager of mines, Hatfield-Campbell Creek Coal Co., has been elected president of the Kanawha Coal Operators' Association. Other officers are: vice president, A. S. WILSON, vice president, Boone County Coal Corporation; labor commissioner, HARRY KENNEDY; statistician, A. O. WILSON; treasurer, JOHN R. DICKINSON; executive secretary, D. C. KENNEDY, elected for his 37th term.

FRANCIS B. MURPHY, of Wilmette, has been appointed director of the State Department of Labor of Illinois by Governor Dwight H. Green. Though the new director has devoted years of study to labor issues and problems, he is not a member of any union or group. Born 41 years ago in Springfield, he is now president of the Deep Water Coal & Dock Co., Chicago, and obtained his first business experience when his father was in the coal business in Springfield and Lincoln. His first important position with the State was in the Department of Mines and Minerals, of which he was secretary for seven years during the administrations of Governor Len Small.

H. A. REID, formerly chief engineer, in charge of operations, has been elected vice president in charge of operations of the United Electric Coal Cos., with operations in Fulton, St. Clair and Perry counties, Illinois.

HENRY S. WALLACE has been appointed director of the Indiana Bureau of Mines and Mining, vice Fred Ferguson.

T. C. WEEKS has resigned as vice president and general manager of the Gaston Coal Co., which operates the Gaston mine, Alpoca, W. Va.

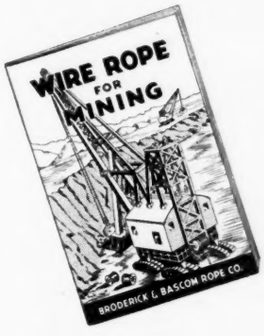
L. H. WINGER, instructor in the Mining Extension Department of the West Virginia University School of Mines in the Beckley district since 1937, has resigned that position to join the personnel department of the Island Creek Coal Co., Holden, W. Va.

•

15 Die in Kentucky Mine Blast

Fifteen miners were killed by an explosion of unexplained origin Oct. 27 in the Daniel Boone mine of the Stirling Coal Co., near Nortonville, Ky. They were part of a shift of 48 men who entered the mine shortly before 7:30 a.m.

A timberman using an open-flame carbide lamp, which ignited the accumulated gas in the mine, caused the blast, according to James Fugate, district mine inspector, who said on Oct. 28 that he; Moss Patterson, chief of the State Department of Mines and Minerals, and C. A. Herbert, of Vincennes, Ind., district engineer, U. S. Bureau of Mines, agreed that this was the cause, following an investigation. Mr. Fugate added that a carbide lamp was found in the section of the mine where the explosion occurred, and that a report had been received from men employed in the mine that a timberman had been observed using a carbide lamp prior to the blast.



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* * *

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Big Sandy-Elkhorn Corners Honors At Lexington State-Wide Meet

First place in every class was captured by teams from the Big Sandy-Elkhorn district in the State-wide first-aid contest held at the University of Kentucky, Lexington, Oct. 4, under auspices of the Kentucky Mining Institute. Furthermore, all of the four top ranking teams in the white contest were from that district. Consolidation Coal Co. teams, which won in the white and colored contests, had already demonstrated their training by winning the week previously at Pikeville in a contest sponsored by the Big Sandy-Elkhorn and Pond Creek-Tug River mining institutes. The following is a listing of the high ranking teams at the Lexington meet, including captains and score percentages:

White—Consolidation Coal Co., Mine 206, Blaine Sexton, 100; South-East Coal Co., J. C. King, 99.86; Inland Steel Co., John Elswick, 99.7; Consolidation Coal Co., Mine 204, John Hill, 99.53.

Colored—Consolidation Coal Co., Mine 214, J. W. Moss, 98.6; West Kentucky Coal

(*Turn to page 86*)

First-Aid Champions of Kentucky.

Team from Consolidation Coal Co., Mine 206. Standing: R. C. Denny, mine superintendent; Blaine Sexton, team captain; Bramble Davidson, H. B. Husband, division manager, and F. M. Correll, safety inspector. Kneeling: Henry Horner, James Wood, patient; Raymond Wetzel and J. C. Correll.

Colored Champions of Kentucky.

Team from Consolidation Coal Co., Mine 214. Standing: M. E. Prunty, superintendent; Robert Chilton, Harry Pevy, Roy Gray, H. B. Husband, division manager, and F. M. Correll, safety inspector. Kneeling: John Moss, Jr., captain; Wilbert Moss, J. W. Moss and Eugene Chilton.

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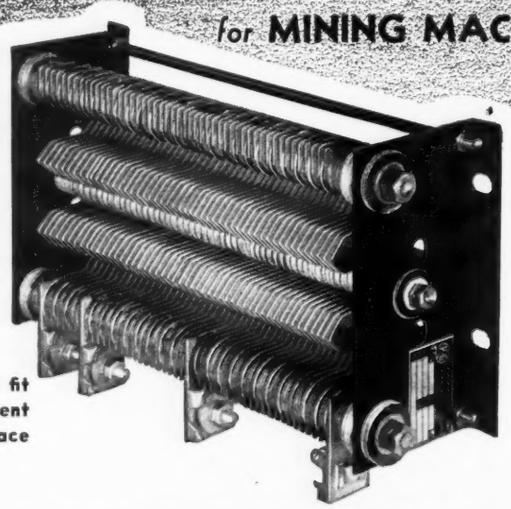

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Co., Ernest Gold, 98.06; Harvey Coal Co., James McGuire, 98.06.

Boys—Consolidation Coal Co., Junior Flint, 97.66.

Girls—Consolidation Coal Co., Jessie Hibbitts, 97.6.

From Stoll Field, the scheduled place, rain drove the meet into a gymnasium. Forty Kentucky teams competed and there was one visiting team, Blue Diamond Coal Co., Westbourne, Tenn., and it demonstrated its efficiency by making a percentage of 99.26. Team and individual loving cups were presented by the National Coal Association and the Kentucky Mining Institute.

A. U. Miller, Mt. Hope, W. Va., directed the meet. The supervisor was W. H. Tomlinson, and his aids were G. T. Powell and W. P. Parks, all three of Norton, Va. The chief judge was L. H. McGuire, Vincennes, Ind. These four men are all connected with the U. S. Bureau of Mines.

Members of the first-aid committee for the institute were: G. M. Patterson, chief of the Department of Mines and Minerals; A. D. Sisk, J. B. Allen, James F. Bryson, Jesse Little, T. L. Boehling and Thomas O. Long. Officers of the institute are: president, E. R. Price, Inland Steel Co., Wheelwright; vice presidents, Floyd Right, Southern Mining Co., Insull; Paul Jones, mining engineer, Madisonville, and C. B. Jackson, Blue Diamond Coal Co., Blue Diamond; secretary-treasurer, A. D. Sisk, Pikeville.

•

Supreme Court Won't Intervene In Out-of-Work Pay Claim

The Supreme Court of the United States on Oct. 13 refused to interfere with Kentucky's denial of the right of miners to collect unemployment compensation for time lost during the 1939 negotiations over a union wage agreement. Acting Unemployment Compensation Commissioner Robert B. Hensley, of Frankfort, Ky., held that the Kentucky law specifically bans compensation to workers idle during a "bona fide labor dispute."

The decision in this case affects 25,000 to 30,000 miners and involves claims totaling about a million dollars. United Mine Workers officials had been awaiting the outcome of this case prior to starting hearings and arguments on similar claims filed after idleness from the same cause this year.

•

How to Make Mines Safer Studied At Pittsburgh Institute Meet

Safety without increased cost and a description of the June 30 explosion at Kent No. 2 mine were the subjects of the first meeting of the 1941–42 season of the Pittsburgh Coal Mining Institute, held in the Mellon Institute Auditorium, Pittsburgh, Pa., the evening of Oct. 17. The attendance was 240. James D. Walker, inspector, 3d Pennsylvania bituminous district and institute president, wielded the gavel. Institute vice presidents are: George A. Shoemaker, general superintendent, Union Collieries Co.; William P. Powers, State mine inspector; and J. M. Connor, general superintendent, Allegheny Pittsburgh Coal Co.

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GO UP
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Waiting for proceedings to start—part of the attendance at the Pittsburgh Coal Mining Institute meeting.

The secretary-treasurer is R. R. Walsh, Mine Safety Appliances Co.

Safety without increased cost can be attained simply by taking advantage of the experience and tools developed in 25 years or more of study and experimentation, declared Reese H. Nicholas, chief mine inspector, Pittsburgh Coal Co., Library, Pa. This applies in all causes of accidents, including haulage, falls of roof, machinery and electricity, etc. It costs no more to use the tools and experience now available than not to use them. Rules for the guidance of officials and men are available and it remains only to study and put them into practice, which is certain to result not only in greater safety but also greater efficiency. Assistance in the form of advice, safety education, first-aid training and other safety measures is offered by federal, State and private agencies and entails no added cost to the company. All that is needed is cooperation.

Almost every coal company, said Mr. Nicholas, provides supervision in excess of legal requirements, but in many cases quantity is no criterion of quality. Supervisors should study themselves, their men and their job and plan ahead to insure both safety and efficiency, in which good relations with the men are a vital element. In addition, active management support is essential and should be backed up by foremen sold on their job and anxious to practice safety principles.

Presenting a complete history of the explosion at the Kent No. 2 mine, McIntyre, Pa., June 30, resulting in the deaths of seven men, George W. Grove, mining engineer, U. S. Bureau of Mines, Pittsburgh, deplored the fact that although the mine had been firebossed some eleven years in the expectation that gas some time would be encountered, an explosion occurred the first time it was noted in any volume (first on June 23 and next on the day of the explosion, both in the same section). Some two years before, a cap had been obtained for a day or two over a fall, which was the only prior record of gas being found.

Bad ventilating practices, in spite of the fact that ample air was being put in the mine, were the cause of the explosion, Mr. Grove reported. A contributing item was the failure of the mine officials, notably the foreman and the assistant in the section in question, to take the proper steps to eliminate the hazard before letting the men go to work. The ignition, which took place about 9 a.m., two hours after starting time, apparently was caused by attempts to repair a permissible mining machine at the face of a gas-filled place, in the course of which an arc was drawn and the gas ignited.

The gas concentration at starting time, according to available evidence, apparently was above the ignition limit, and probably had been brought down by blower operation to just under that limit when it was ignited. Consequently, there was little force or violence and the ignition did not stir up dust or extend to other parts of the mine, which now makes enough gas, Mr. Grove related, to show in every split and the main return. The Kent No. 2 experience, as well as many other explosions, he concluded, show that treating any mine as non-gaseous is a dangerous business.

Coming Meetings

- American Mining Congress, Coal Division: annual conference, Nov. 21, William Penn Hotel, Pittsburgh, Pa.
- Kentucky Mining Institute: annual meeting, Dec. 5 and 6, Lexington, Ky.
- Coal Mining Institute of America: annual meeting, Dec. 11 and 12, Fort Pitt Hotel, Pittsburgh, Pa.
- Indiana Coal Mining Institute: annual meeting, Dec. 6, Terre Haute House, Terre Haute, Ind.
- Seventh International Heating and Ventilating Exposition: under auspices of American Society of Heating and Ventilating Engineers, Jan. 26-30, 1942, Philadelphia, Pa.
- American Mining Congress: coal convention and exposition, week of April 27, 1942.

New Preparation Facilities

AMHERST COAL CO., Accoville, W. Va.—Contract closed with Kanawha Mfg. Co. for headhouse equipment to handle mine-run coal from dump to tipple, consisting of dump, feeder and mine-run belt conveyor; capacity, 250 t.p.h.

BELLEMEAD COAL CO., Sabine, W. Va.—

Contract closed with Kanawha Mfg. Co. for locomotive coaling station consisting of storage bin and multiple gates and coaling chutes.

GARAUX BROS. CORPORATION, Strip Mine at Canton, Ohio—Contract closed with Morrow Mfg. Co. for tipple equipped with feeder, conveyor, screens, etc.; capacity, 200 t.p.h. of mine-run.

JAY C. JAMISON, Edna Mine, Brady, W. Va.—Contract closed with Jeffrey Mfg. Co. for two-compartment Baum jig; capacity 165 t.p.h. of 2x$\frac{3}{8}$-in. or 200 t.p.h. of 5x$\frac{3}{8}$-in. coal.

JAMISON COAL & COKE CO., Farmington, Pa.—Contract closed with Jeffrey Mfg. Co. for two-compartment diaphragm jig; capacity, 140 t.p.h. of 4x$\frac{1}{2}$-in. coal.

JEFFERSON CO., Fernwood Mine, Bloomingdale, Ohio—Contract closed with Morrow Mfg. Co. for tipple equipped with feeder, shaking screens and loading booms; capacity, 150 t.p.h. of mine-run.

MAXTON COAL CO., Morrisdale, Pa.—Contract closed with Morrow Mfg. Co. for steel tipple equipped with feeder, conveyors, sizing and dewatering screens, and sludge-handling equipment; capacity, 250 t.p.h.

NEW RIVER CO., Oswald, W. Va.—Contract closed with Jeffrey Mfg. Co. for tipple additions; capacity, 200 t.p.h. of mine-run.

RIVERCOAL, INC., Bellaire, Ohio—Contract closed with Jeffrey Mfg. Co., for washing plant; capacity, 50 t.p.h. of 0x3-in. coal.

WYATT COAL CO., Sharon, W. Va.—Contract closed with Kanawha Mfg. Co. for coal-crushing plant consisting of scalping screen, crusher and reassembling chutes; capacity, 250 t.p.h.

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Cost-of-Living Bonus Boosted For Canadian Miners

An increase of $2.55 a week, making a total of $3.45, in the cost-of-living bonus paid to Nova Scotia miners has been decided upon, and as a result the Wartime Prices and Trade Board has authorized an increase of 22c. a ton in the price of coal produced and sold in that province. Decision to raise the present 90c. a week bonus to miners was reached at meetings between representatives of the major operators, their employees as represented by the executive officers of District 26, United Mine Workers; Coal Administrator J. McG. Stewart and Dr. Bryce Stewart, Deputy Minister of Labor. These discussions lasted two days.

Miners in a number of Nova Scotia mines decided during the first week in October to abandon the slow-down policy which had been in effect for several months, causing a serious drop in production. The conferences were held to discuss matters of difference between the companies and the men.

The Britnell commission, appointed by the Federal Coal Administrator to inquire into the need for a cost-of-living bonus to coal miners of the Estevan-Bienfait region of southeastern Saskatchewan, Canada, has recommended a bonus of 33c. daily for six days per week be paid the miners. Immediately on receipt of the commission's report in Ottawa, the Wartime Prices and Trade Board ruled that the operators might recover the cost of the bonus by a price increase.

Broad-Interest Program With Dust Allaying As Star Feature Engages Safety Council

A FEW YEARS back, the industry believed coal dust would sing its swan song in the mines as soon as rock dust was distributed along the roadways and rooms, but it is still the great offender, greater just now than it was a few years back. There now are laid at the door of dust, diseases for which there was no name a generation ago. Dust from coal is harmful to those who breathe it, and some is likely to explode; dust from siliceous rock produces silicotic lesions that may lead the way to tuberculosis. So, in the place of honor at the proceedings of the Mining Sectional meeting of the 30th National Safety Congress, held Oct. 6–10, in Chicago, was a dust-allaying symposium with wetting agents as the means of alleviating the dust plague.

After the symposium shots were scattered: safety goggles, too often distributed as if

Cadwallader Evans, retiring general chairman.

no one had ever heard of eyestrain; storage and handling of explosives in rock underground, electrical safeguards in mechanical mining, signaling from the cage, training personnel in safety—and in efficiency also—and mine safety as seen from other angles. Cadwallader Evans, vice-president and general manager, Hudson Coal Co., acted as general chairman.

Certain Chemicals Make Dust Thirsty for Water—Wetting agents, when added to the water in the mine, asserted C. W. Owings, mining engineer, Safety Division, U. S. Bureau of Mines, Pittsburgh, Pa., reduce the surface tension existing between water and coal or other material, preventing the solution from forming a globule and enabling it to spread rapidly over the surface of the dust particles, so that it comes in contact with, and thus wets, them. Thus wetted, particles suspended in the air tend to fall. Tests show that the concentration of dust in the air as may be expressed in millions of particles per cubic foot may be reduced one-half or more by an effective application of water and generally a half to one-third as much liquid is required to do the job. The solution will penetrate into a pile of material several feet deep with a minimum of liquid, where, ordinarily, water untreated will penetrate only a few inches.

Fineness and Concentration of Dust—The size of average atmospheric mine dust is less than ½ micron and there are 25,400 microns to the inch. If, however, a piece of coal 1 cubic centimeter in size is broken into particles of 1 whole micron there will be a trillion (1,000,000,000,000) of them and they will have a surface of 6 square meters, as compared with 6 square centimeters for the original 1-centimeter cube. The fall of the larger particles tends to clear the air by carrying down the finer particles, which, however, readily can be put again into suspension.

There is now a general opinion that dust should be so controlled that not more than five million particles of silica will be present in each cubic foot of air. Following this opinion closely, as many as a hundred million particles per cubic foot of air will be present if the silica content be 5 per cent, which is too high a concentration. When the dust is that of coal, twenty million particles probably is safe. With that percentage, the miners will be able to see clearly, the dust in suspension will not explode, the health of the worker will not be affected appreciably and the deposition of coal dust will not cause the rock dust to lose its efficiency rapidly. The finer the spray the better it will wet the dust, but the smaller the dust particle, the more difficult it is to wet it with water.

Air Coating Excludes Water

Wetting Agent Lives Double Life—When dust is to be wetted, added Mr. Owings, the film of air on the coal will not be expelled unless the liquid spreads with sufficient force that the air will be driven ahead of it. Unless it does so, the dust will not be wetted. The molecules of a powerful wetting agent are large and have two distinct yet chemically wedded parts, one having affinity for, and soluble in, water (the polar or hydrophilic member) and the other with a strong affinity for oil- or water-insoluble substances (the non-polar or hydrophobic member). No mere emulsion of polar and non-polar members will serve; they must chemically wed. Mineral oil mixed with lye will not serve, but lye combined chemically with grease to form soap, one of the earliest and simplest of wetting agents, will give the desired effect, but in an inadequate degree, because the polar and non-polar members are not properly balanced. The non-polar member should pull toward the water-repellent surfaces with a force equal to that with which the polar group will pull toward water.

Wetting Agents Not Penetrants—A powerful and fast wetting agent should wet and spread quickly and thoroughly, but the most powerful wetting agents rarely are good penetrants. If a small indentation is made in the top of a cone of fine coal dust and a drop of plain water is placed in it, the drop will neither wet nor penetrate the coal. If light oil, kerosene or similar organic liquid is used, it will penetrate the

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pile deeply, but if a drop of a wetting agent well diluted with water is put in the same place, the top of the coal instantly will become wet, but the main part of the drop will not penetrate, for the fine coal will absorb so many wetting-agent molecules that it will exhaust the solution, leaving plain water behind it. However, wetting-agent solutions, if concentrated, are able to penetrate.

If the base of the cone is surrounded with plain water, however, this will not soak into the coal or wet it. A drop of oil, though a good penetrant, placed in the water will not change the condition, but a droplet of wetting agent will start a vigorous action immediately. The water will become black with particles and soon the whole cone will flatten and become wet. Here a small quantity of the coal did not have the prior chance to absorb large quantities of the wetting agent, but each particle got just enough to get wet. With spraying, the distribution is much more complete.

Highly diluted wetting agents do not penetrate but will make water spread and penetrate if properly applied. However, wetting-agent solution sprayed over a car of mine-run coal will penetrate, for the solution will run down between the lumps, and the solution will moisten the contents of the entire car.

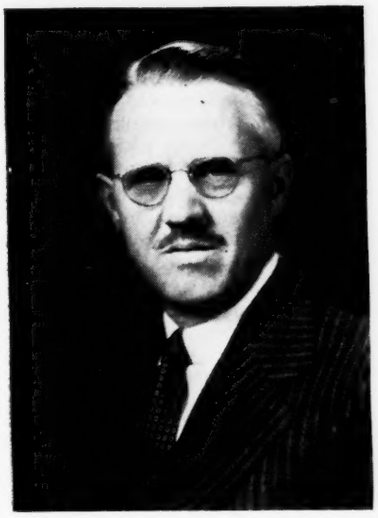
Wetting Agent's Twelve Points

What a Good Wetting Agent Should Be—Wetting agents for the mines should readily mix with water, should not form a mixture that needs to be agitated before use or that precipitates on standing, and they should be capable of being mixed with highly acid to slightly alkaline water. Mildly acid water may become highly acid in a short time and, like soaps, many wetting agents will not act in water that is hard. They should be of a type that will not be affected if acid water is neutralized with lime. Nor should the agent be toxic, for men often drink hose water; it should be filterable and have little taste and no objectionable odor.

It also should be noncorrosive and so inexpensive that the cost should be below 1c. per ton of coal. To meet this requirement, the quantity of agent undoubtedly will be less than 1 per cent; such a concentration will hardly make the mixture corrosive.

Many dedusting agents are combustible and explosive, especially when exposed to rapid oxidation, as will happen when they are atomized; thus, such agents as a mist are hazardous underground. Some oils mixed with 50 per cent water may be ignited and will burn when sprayed. Some agents are precipitated from solution and are redissolved only with great difficulty. One agent precipitated when the temperature fell below 70 deg., and it took three days to redissolve the mixture. Even then it would not long remain in solution. One wetting agent is most efficient at above 100 deg. F., but at coal-mine temperatures cannot be used economically. If dust-allaying water is stored on the surface, it may be exposed to low temperatures and consequently the mine temperature is not the only heat factor to consider.

If the solution clouds, it is a sign of sep-



W. D. Haselton, new general chairman

aration and deposits may form which will clog sprays or even pumps. The most successful filter is a substance similar to Carborundum. Some wetting agents lose their activity when stored in steel or galvanized-iron containers. To reduce transportation costs, and quantity of agent needed, agents should be active even at great dilution. Once moistened with water containing a wetting agent, the material may dry out, but it can be moistened readily thereafter with water, for the agent will still be present.

Pipe Treated Water Into Mines

With such an agent water can be piped into the mines, and gravity be used for operating the sprays.

How to Deliver Water—Two- to 6-in. pipe is used in primary distribution lines; secondary lines range from 1 to 2½ in., and in working places ½ to 1½ in. may be used, but ¾-in. predominates. However, portable tanks may be used with strainers to filter out rust, coal and other obstructions that might injure the pumps. By a venturi and a regulating valve, admission of the wetting agent can be automatically controlled. Full-cone nozzles are preferable where dust is formed rapidly. Sheet or fishtail sprays without interior vanes, depending on their oblong orifices for their effectiveness, may be used on the tops of mine cars and at the rear or sides of mining machines where fine material is shoveled.

Misting nozzles which are of low capacity, ⅝ to 3½ gal. per hour, depending on pressure with angles of effectiveness of 70 to 95 deg. at 100 lb. pressure, make good water curtains.

Other remarks were made by G. R. Gardner, research chemist, Pittsburgh Coal Co., and G. A. Mau, Johnson-March Corporation. References to dust reduction by C. A. Peterson, safety inspector, Hudson Coal Co., find place in the Foremen's Question Forum in this issue.

Fit Goggles to Employee's Face—Before goggles are bought, companies should be able to answer the question: "How can we induce the men to wear goggles," observed C. E. McKnight, safety director, Lake Shore Mines, Ltd., who listed 26 jobs and added 11 other unspecified jobs in the performance

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Prefer it because it is light and easy to handle—because it is strong, extra strong, to pull out from under a drop of several tons—because the double rubber insulation is smooth and hard over a soft core, giving a long life of hard service.

WRITE FOR PRICES OF COILS OF ANY LENGTH, EITHER SOLID OR STRANDED CONDUCTORS.

Paragon Electric Co. 405 S. Dearborn St. CHICAGO

of which eye accidents had occurred in a period of two years. He also mentioned 38 mechanical instrumentalities, such as tools, explosions, electricity, conveyors, etc., which had caused eye accidents.

To be comfortable and easy to wear, goggles should be of the right type and carefully fitted to the face of each workman. One mine installed a thousand spectacle-type goggles without fitting any. Ten days later, the safety engineer declared the men were much dissatisfied. At Mr. McKnight's suggestion all the goggles were recalled and reissued to suit each case, and complaints immediately declined.

Examined and Begoggled Free

On inquiry of Richard Maize, Secretary of Mines of Pennsylvania, R. R. Knill, safety engineer, Union Pacific Coal Co., declared that the men working for that company received a free examination of their eyes and were fitted free with Full-Vue goggles having prescription lenses. Later, they can be reexamined without cost but are required to pay if they want new goggles. His remarks on the methods used by his company to train the men in operation of loading and cutting machines will appear in a later issue.

Blasting Precautions in Rock Work—During electric storms, charging and blasting of rounds in shaft sinking should be prohibited, declared E. D. McNeil, Jr., Hercules Powder Co., Virginia, Minn. When a missed hole is found, it is common practice to recharge with another primer and refire, and then if this fails, another primer is inserted. It is generally believed that this is safer than trying to redrill a parallel hole with the possibility of drilling into the unfired charge. An article delivered by J. F. Conrad, electrical inspector, Pennsylvania Department of Mines, may be found in the Foremen's Question Forum of this issue.

Signaling to Hoisting Engineer From Cage—With the carrier-current signaling system, asserted John Treweek, Homestake Mining Co., Lead, S. D., on behalf of E. C. Ross, mine superintendent, and J. F. Wiggert, chief electrical engineer, hoisting engineer and cager are in constant communication, a safety factor impossible with the old system that required the cager to reach outside the cage to give signals. Not only is the new system safer but it greatly outclasses bells and is a big improvement in shaft-repair or construction work.

This signaling system, described in T. P. No. 1286, Vol. A. 129A., American Institute

Bureau of Mines Approvals

Three approvals of permissible equipment were issued by the U. S. Bureau of Mines in September, as follows:

Goodman Mfg. Co.—Type G-12½ shaker conveyor; 10-hp. motor, 500 volts, d.c.; Approval 435A; Sept. 17.

American Mine Door Co.—Type "MM Dustributor" (rock-dusting machine); 2-hp. motor, 500 volts, d.c.; Approval 369A; Sept. 19.

Joy Mfg. Co.—Type 12-BU-7 loading machine; five 4-hp. motors, 250 and 500 volts, d.c.; Approvals 436 and 436A; Sept. 25.

of Mining and Metallurgical Engineers, requires less wiring, conduit, etc., than the usual wire-connected system, particularly in deep shafts. Each signaling switch is connected by a separate wire to an annunciator at the engineer's station, who thus always knows exactly where the signal originated. This prevents the cage or skip being moved in response to a fake signal sent from a switch other than the one where, at the moment, the cage or skip is located, thus preventing accidents.

Because the new system uses an oral signal, which can be made more specific and detailed, it should be safer than code signaling. As the signaling equipment is mounted on the cage, accidents may be prevented if trouble occurs with the cage in motion, for the engineer can be ordered at any moment to stop the hoist. Used for many years, the operation of this system has been free from accident.

Mechanization in Anthracite Mines—In 1916, the Delaware & Hudson Coal Co. introduced a Jeffrey pit-car loader, the first used in the anthracite region, and also a scraper loader, asserted Mr. Peterson, delivering the address of D. C. Jones, supervisor, coal mining extension, Pennsylvania State College.

Increasing Efficiency of Machinery—One company (1) has issued letters of instruction to section foremen on the proper care and handling of equipment; (2) has had special main-office engineers inspect equipment and survey mine practices; (3) has had studies conducted into possible improvements in design that would eliminate mechanical trouble, and (4) has placed responsibility for maintenance and lubrication of equipment on persons assigned to that work at each colliery.

Training Courses Instituted—In consequence, 295 of 300 shaker-conveyor units purchased since 1926 are still working, but nevertheless the company decided to set up a training program for mechanical foremen and employees at one of its largest collieries.

New Officials Elected By Mining Section

General Chairman, W. D. Haselton, safety engineer, Pickands-Mather Co., Duluth, Minn.; First Vice-Chairman, N. P. Rhinehart, chief, West Virginia Department of Mines, Charleston, W. Va.; Second Vice-Chairman, John Treweek, safety engineer, Homestake Mining Co., Lead, N. D.; Third Vice Chairman, M. L. Coulter, safety engineer, Clearfield Bituminous Coal Corporation, Indiana, Pa.; Secretary and News-Letter Editor, Dan Harrington, Chief, Safety and Health Division, U. S. Bureau of Mines, Washington, D. C.; Health Committee Chairman, Dr. A. L. Murray, U. S. Bureau of Mines, Pittsburgh, Pa.; Membership Committee Chairman, Cadwallader Evans, vice president and general manager, Hudson Coal Co., Scranton, Pa.; Poster and Slide Committee Chairman, J. J. Forbes, U. S. Bureau of Mines, Pittsburgh, Pa.; Statistics Committee Chairman, W. W. Adams, U. S. Bureau of Mines; Entertainment Committee Chairman, J. T. Ryan, Jr., president, Mine Safety Appliances Co., Pittsburgh, Pa.

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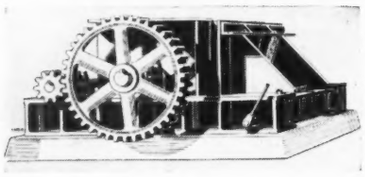

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All bosses, including mine foremen and maintenance foremen, were included in the classes, because they should know as much about the equipment being used as the men over whom they have charge. Many employees were not asked to enter the classes or did not volunteer when the classes were advertised, but it was felt they could be trained later on the lines of the present program or of one fitted to their peculiar needs.

All were given psychological tests to determine: (1) mental alertness, (2) mechanical aptitude, and (3) emotional stability or reaction to everyday situations. These men were then rated in five groups. All were permitted to enter the classes. Some with low-test scores voluntarily dropped out as the work became progressively more difficult. The curriculum was designed to reduce maintenance costs, to upgrade employees, to increase production and to decrease accidents.

Detail of Training—Three courses, each consisting of one class session of two hours each week for ten weeks, made the entire course last 30 weeks. Bosses were kept one course ahead of the hourly men. Classes were held at the colliery, with morning and evening sessions to make instruction available to all the men regardless of the shift on which they might be working in any one week. Course I consisted of arithmetic, simple mechanics, strength of materials, elementary electricity; Course II of construction, operation, lubrication, transportation and hazards of the particular mining equipment in operation at the colliery. At nearly every session, equipment shopped for repair was inspected. The cause of the breakdown, whether abuse, neglect or faulty design, was explained, and reports were made by each student.

In the first course, a member of the college extension services was in charge. The instructor in the second course was a college-trained company employee with experience in operation of mechanical equipment. For the hourly men's classes, this instructor was superseded by eight other company bosses, more or less specialists in handling the pieces of equipment under study.

Course III covers fundamentals of design, application and control of electric motors for pumps, conveyors or other equipment. Texts were furnished by the college and instruction by a well-experienced company employee. All training was in an underground shop with motor and switchboard with means supplied for loading the motor. All students were required to make reports.

No Bosses Dropped Out, but Over Half the Hourly Men—In pre-course tests 176 men were examined, 47 bosses and 129 hourly men. In Course II, one of the bosses was instructor, so there were 46 only, to which number two more were added to make 48, all of whom completed all three classes. In the hourly men group, 74 men completed the work in Course I, 56 in Course II and possibly 50 will complete Course III. Extra training was given to men having no experience with any one or more of the certain kinds of equipment being studied. When training is given by a company instructor and only on the type of equipment in use, the teaching is likely to be pertinent and to elicit more interest.

We need not only training for foremen and assistant foremen, said Thomas Allen, chief inspector of coal mines, Colorado, but instruction for men at the face, to which assertion Mr. Evans responded that the officials were in need of training and it was thought best to give it to them first. Training for the rank and file will follow later.

An analysis of some thousands of accidents, declared Dan Harrington, chief, Safety and Health Branch, U. S. Bureau of Mines, reading the address of A. W. Macdonald, superintendent of industrial relations, Dominion Steel & Coal Corporation, Sydney, N. S., Canada, shows the percentage of accidents arising from the following general classes to be as in the tabulation:

Causes of Accident	Percentage
Faulty instruction of employees	30
Inattention and carelessness of employees	22
Unsafe practices	14
Lack of discipline	12
Mechanical hazards	10
Incompetency of employee	8
Physical unfitness	3
Mental unfitness	1
	100

To Open Second Stripping

Central States Collieries, Inc., Canton, Ill., is developing a second strip mine near Cuba, Ill., to be known as Sunnyside. Grading is completed, most of the equipment has been provided for, and production is expected to begin at an early date. Coal will be transported to Little Sister mine for preparation.

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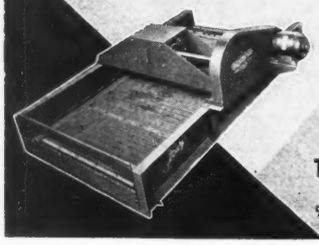

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Western Canadians Discuss Cleaning, Briquets Mechanization, Steel Timber and Tunnels

ALBERTA, Canada, has heavily pitching seams, some of them quite thick. Their coal is young in geologic years, but in some parts has been greatly matured by pressure-generated heat. Being of recent origin, the beds are derived largely from evergreens and thus the coal contains so much resin that it can be briquetted without binder, something that hitherto, it has been thought, could be done only with unmatured coals. Some of the coal is being mechanically loaded and more of it will be later. Mechanical cleaning is making progress, but the cold climate is holding back wet methods. Tunneling is as frequent perhaps as in the anthracite region of Pennsylvania. Cardox is being used. Steel supports are displacing wood—and that in an area not far from well-timbered tracts. Alberta operators indeed are up and doing.

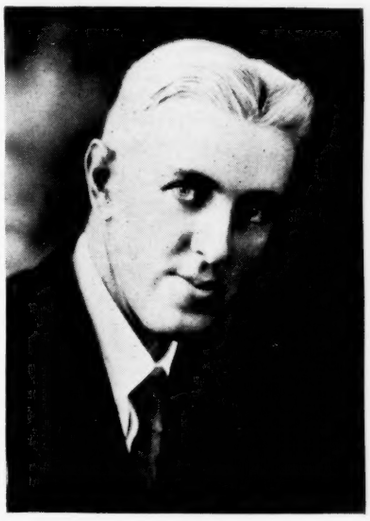
No wonder 740 persons were present to discuss these developments at the 23d Annual Western Meeting of the Canadian Institute of Mining and Metallurgy, held Oct. 1-3 at Edmonton, Alta., under the auspices of the North Alberta branch of the institute. Another discussion covered wartime problems. Canadian coal operators are having their troubles with the removal of skilled men from the mines to war industry and are threatened with more of the same trouble; all of which they bear with the best of spirit. They are looking to recover markets for Alberta in the provinces of Manitoba and Ontario; this possibility they also discussed. Other addresses covered duckbill loading, metal mining, fireclay, oil and gas, the highly original methods of coal study developed by the Research Council of Alberta and the development of Nova Scotian resources.

Markets in Ontario for Alberta Coal—Ontario, asserted H. Stutchbury, Abasand Oils, Ltd., Edmonton, should be a market for Alberta coal and might be if the operators could be assured that the subvention provided by the Dominion government were given at least some degree of permanence instead of being enacted from year to year, so that expenditures for equipment are based on a hazard that may eventuate in a catastrophe if the government should decide against further subventions. Another desirable change would be a lower freight rate, which Mr. Stutchbury thought the railroads could afford, as then traffic would be available in both directions.

Sole Aim to Sell Alberta Coal

There should, Mr. Stutchbury said, be only one selling agency, thus reducing marketing cost, divided counsels and rivalry. Above all, the argument should not be that the coal is Canadian and to be purchased for that reason. The public does not like to be thus coerced. The basis for sale should be service, and Alberta coal could meet the test. [The Alberta operators are faced with competition from oil and gas in their home market and with strong competition in their remoter markets from coal mined in the United States and from refuse wood in the Western American States.]

Briquetting Medium-Volatile Bituminous Coal Without Binder—Demand for coal, declared J. A. Brusset, general manager, West Canadian Collieries, Ltd., Blairmore, Alta., is centering on sizes between ¼-in. and 4-in., and the minus ¼-in. coal can be sold only with difficulty unless converted to coke or briquets. For this reason, at the Greenhill mine, some of the coal has been reduced to 1 per cent moisture and crushed to 100-mesh, fed by a worm to the center of a centrifugal de-aerator consisting of paddles rotating at 48 r.p.m. The dust originally contains 50 per cent of air, which must be removed or the briquet will burst.



W. G. McBride

Professor of Mining, McGill University, and president of the Canadian Institute of Mining and Metallurgy.

After de-aeration, it is fed under pressure and a temperature of 250 deg. F. to a 75-hp. 5-ton-per-hour Komarek press, where, according to the manufacturer, it is submitted to a pressure of 35,000 lb. per square inch. The press differs from that used when making briquets with binder, the rolls being shorter and bearings wider in proportion to their diameter. The rolls are mounted without springs on the press frame, wear being adjusted by shims.

Unusually small briquets, 1¼x1⅝ in. oval, are made, each weighing about an ounce. Accordingly, they can be added to minus 1⅝-in. coal. They will resist a crushing pressure of about 80 lb., about the strength of the coal from which they are made. Increase of temperature above 250 deg. F. does not appear to improve them. A second press was to be installed in October of this year.

Cleaning Minus Quarter-Inch Fines Dustlessly—Hydraulic processes appear, he added, to give the most accurate separation of coal from refuse, but the coal absorbs 25 to 30 per cent of water in the process, which it is costly to remove. Much sludge is formed, disposal of which is difficult. Previous commercial pneumatic processes, he declared, use a rising air current, continuous or interrupted, through a previous deck, either stationary or vibrated.

Always traveling upward, the fine dust particles of whatever specific gravity rise to the surface of the bed, leaving the lower part so permeable to air that a great volume passes through the bed, causing a separation more by size and shape of particles than by specific gravity. Only the largest particles of rock actually separate from the refuse, and these are found at the bottom of the bed and on the deck. Such processes, to be efficient, must operate on a size range of 1:2 and will give only indifferent results where the sizes range all the way from zero to ¼ in.

Above the bed which rests on the shaking deck of the new "air jig," as it has been dubbed, is created, about 200 times per minute, a vacuum which is followed by a somewhat smaller pressure. By using a vacuum on the top of the bed, the bed is loosened at its upper surface rather than pushed up from below, giving greater fluidity. The pressure which follows pushes the finest particles back into the bed, plugging the channels, so as to reduce air travel. During the vacuum stage that follows, the bed is simply distended and is in such a perfectly fluid condition that the heavy particles can settle down according to gravity, irrespective of their size or shape and unobstructed by any air current.

Keeps Air Inside Cleaner

The air jig has two opposing identical chambers, each with a shaking deck mounted on roller bearings and actuated by a differential drive; the air passes from one to the other in a closed circuit. In this manner, and by providing airtight multiple seals at all joints, the machine has been made dustless. Extractors, being of revolving-star type, also are airtight, so no costly and inefficient dust collectors are needed, and the machine is self-contained; thus its construction is inexpensive.

Decks incline 4 deg. toward the clean coal end, are given a differential motion, more rapid in that direction than in the other and synchronized with the vacuum period. The vacuum does not lift the refuse off the bed and when the deck travels back it carries the refuse along with it so that eventually the impurities arrive at the top of the deck. Meantime, clean coal and middlings flow by gravity to their respective extractors. A variable-speed pawl-and-ratchet device actuates the middlings extractor, thus varying the quantity of middlings and accordingly their ash content. Chutes leading from dust bins are sealed by weighted trays to prevent the escape of dust.

Cleaning With Solid Suspensions Is Under Test—A 5-ton-per-hour unit using the solid-suspension method for increasing the gravity of water was installed at the Greenhill mine in the autumn of 1940 and cleaned about 2,000 tons of coal to 6.5 per cent ash. Several features, as yet unpatented, have been developed. Last July, a 50-ton-per-hour unit for ¼x1½-in. coal was installed.

Briquetting With Binder—Experiments in briquetting with binder on a William Johnson press from Leeds, England, and a Komarek-Greaves press were described by John Shanks, general manager, Brazeau Collieries. Three per cent of pitch was

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mixed with the coal and 150 tons was briquetted in a day.

Dust in excess of that needed to fill voids in the coarser coal should be avoided, in making briquets, declared Edgar Stansfield, Research Council of Alberta, as too much binder is required to bind the dust. Emulsification of the pitch, said Mr. Shanks, makes it possible to put more dust in the briquets. Opinions differ as how to add the water, added Dr. Stansfield. He had used it at all times in the process and had been successful in getting a strong bond. The requirements as to size are different with the binderless briquet from those where the briquet is made with binder.

How the Greenhill mine makes its own steel arches out of rails was described by H. Blake, mine superintendent. These arches were described in *Coal Age*, June, 1940, p. 33, but Mr. Blake had much to add about their life, service, manufacture and lagging.

Duckbill Loaders in Drumheller—Though difficulties have been experienced in using the duckbill for operation of the lower seam of the Drumheller valley, asserted W. Wilson, mine superintendent, Monarch Coal Mining Co., he believes that duckbill operation is desirable even under the conditions there met, which are bad also for any other system. The thickness of the seam runs from 3 to 61 ft., but not all in one piece. Its chief impurity is bone, which varies in thickness and condition. The seam has a good roof and bottom. Cross gradients sometimes give serious difficulties in handling the duckbill.

Usually rooms are driven 20 to 30 ft. wide, and good pillars are left, but in some mines the pillars are not recovered, and in that event they generally are made small. These methods have given good results, and rarely have creeps occurred.

Floor Tilted Over Coal Seam

Mining a Thick Overturned Seam—The operation of a 33-ft. low-volatile bituminous coal seam turned bodily over so that it lies at an angle of 73 to 87 deg. to the horizontal, was described by N. Melnyk, mining engineer, Cadomin Coal Co. Throughout the mine, the ground on which the peat bog once rested has become the roof of the mine. To make matters more difficult, the workings above the upper level have caught fire, and the coal has to be extracted from depths below that fire.

Calorific value of the coal is 13,600 B.t.u. or higher. The mine has been worked in panels which mount directly up the pitch with pillars between panels 200 ft. wide. In the first mining of these panels, 15 per cent of the coal in the panel is removed, leaving 85 per cent in pillars. Ventilation is difficult, and to remove methane a series of 6-in. boreholes was drilled down to the domed openings formed when coal was extracted from the panels, but this did not seem to decrease the quantity of gas leaving by the return. Ventilating pressure is 7-in. water gage and the air is heated in the winter before it enters the mine. Fires in the upper level prevent that passage from being used as an airway.

Rock tunneling has replaced roads in coal for some purposes at Coleman, Alta., in a mine of the McGillivary Creek Coal &

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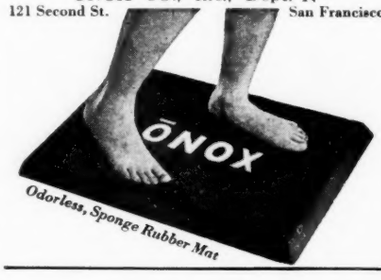

Coke Co., said J. J. McIntyre in an article to which reference may be made in a later issue.

Putting Air Drying Under Control—At the laboratory of the Council, declared W. A. Lang, Research Council of Alberta, a method has been devised by which coal can be air-dried under controlled temperature, controlled humidity and in an atmosphere in which no oxidation can occur, a marked improvement, especially with high-moisture coals, over methods generally used and one that gives standardized values for the moisture-holding property of the coal.

Softening Temperature Best Criterion of Fusibility—Because of the segregations of various materials—shale, silicates, pyrite, calcite, etc.—which vary greatly in fusibility, the laboratory test of a finely ground intimate mixture of all the ash cannot be expected to be completely satisfactory. When coal is burned as powdered fuel, the laboratory test more closely resembles actual commercial conditions, than with any other type of combustion. The softening temperature of a test cone rather than the temperature of initial deformation or the fluid temperature most closely represents the temperature at which clinker in a furnace will form. The intervals between initial deformation and softening temperature and again between softening and fluid temperature give a further indication of the clinkering characteristics of a coal ash.

After All, Ignition Temperature Is Temperature When Coal Will Ignite—At the Edmonton laboratory, tests of the ignitability of coal are being made by finding the temperature of the air blast that will ignite small pieces of coal within a specified time. Near the critical temperature, one or two pieces usually fire ahead of the other 20 or 30 pieces present. The lowest temperature at which these ignite and fire the rest is the significant figure. This is true, though the method may not be as reproducible as that devised by the late R. V. Wheeler.

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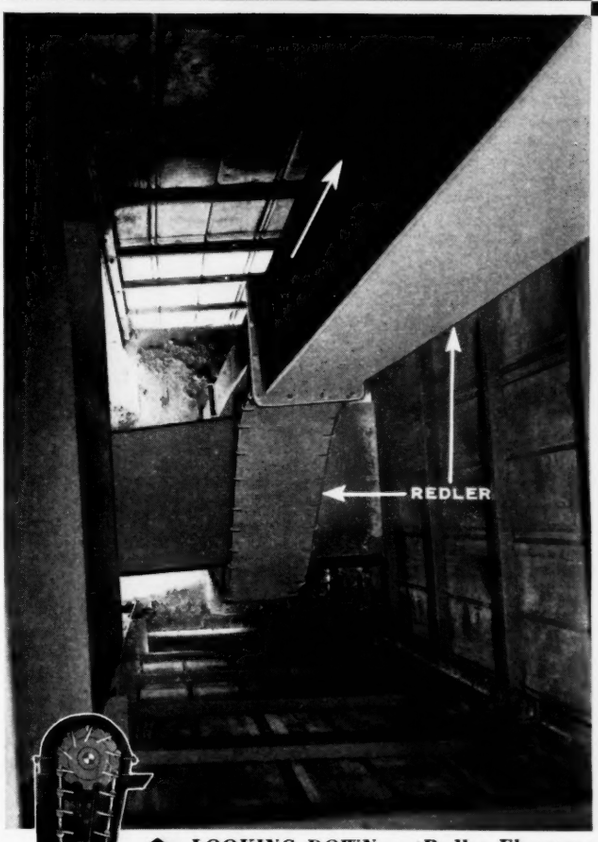
Sixth Sentinels Trophy Captured By Union Pacific Coal Co.

Union Pacific Coal Co. was awarded the Sentinels of Safety trophy for the sixth time on Sept. 27. On this occasion the award went to its Rock Springs No. 4 mine for 1940 on the basis of a record of 360,955 man-hours of exposure with but one lost-time accident, the severity rate computed on the Bureau of Mines formula being 0.108, the best record in safety made by any bituminous coal mine in the United States for last year.

Presentation of the trophy was made by T. T. Read, a member of the committee of award, who occupies the Vinton Chair of Mining at Columbia University, New York City, at a banquet held in the Union Pacific Coal Co.'s Old Timers' Building at Rock Springs, Wyo. There were about 300 at the banquet, including the men who worked in the No. 4 mine during 1940, officials of the company and invited guests.

Eugene McAuliffe, president of the company, accepted the trophy for No. 4 mine and tendered his thanks to the *Explosives Engineer* for originating the trophy, and to the men of the U. S. Bureau of Mines

Convey-Elevate in **1 REDLER**
in 1/4 the Usual Space



LOOKING DOWN on Redler Elevator handling fines at Glendora Mine No. 27, near Sullivan, Indiana.

LOOP BOOT REDLER Elevator in phantom elevation.

"Redlers need no attention . .

. . other than lubrication", says the Chief Engineer of Templeton-Matthews Corporation, Terre Haute, Indiana, about the above installation.

Another proof of the ever-increasing satisfaction with Redlers for handling fines and lump coal in a totally enclosed, *dust-tight* casing. One Redler can both convey and elevate . . without the expense of Feeders or deep elevator pits . . in ¼ the usual space. There are many different shapes to suit your need. *CHECK UP ON POSSIBLE SAVINGS YOU CAN REALIZE IN DATA BOOK 140.*

Stephens-Adamson Mfg. Co.
2 Ridgeway Avenue • Aurora, Illinois

L-TYPE REDLER

S-A CONVEYORS • DRY COAL CLEANERS

who have done so much for the mining industry. W. W. Kessler, of the Bureau of Mines, presented to Thomas Overy Sr., superintendent of the Rock Springs mines, individual certificates for the men in No. 4 operation.

George B. Pryde, vice president in charge of operations, spoke briefly regarding the history of No. 4 mine, pointing out that it was in this operation, which is almost 60 years old, that mining machinery was first introduced in the western part of the United States, the earliest machinery consisting of air-operated mining machines and drills.

V. O. Murray, general superintendent of the company, acted as toastmaster at the banquet, and R. R. Knill, the company's safety engineer, and James M. Sampson, State inspector of coal mines for Wyoming, also spoke briefly on safety accomplishments.

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A. M. C. Coal Division Conference To Study Committee Reports

The annual conference of the Coal Division of The American Mining Congress, under the chairmanship of R. L. Ireland Jr., president, Hanna Coal Co., will be held Nov. 21 at the William Penn Hotel, Pittsburgh, Pa. There will be morning and afternoon sessions, when consideration will be given to the reports of the committees on mechanical loading, conveyor mining, haulage, power, preparation, roof action, safety, ventilation, and stream clarification.

At the annual dinner, in the evening, there will be a presentation of the subject of priorities. Speakers will be Wilbur A. Nelson, Coordinator of Mining Priorities, and his assistant for coal mining, D. L. McElroy.

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Keystone Coal Buyers' Manual For 1941 Ready Soon

The 1941 edition of the Keystone Coal Buyers' Manual, edited by Sydney A. Hale and published by the McGraw-Hill Publishing Co., Inc., will be out on Nov. 15. This, the 23d edition, completely revised, includes a directory of 2,639 coal mines located in the United States, listed alphabetically and geographically.

More than 4,000 individual mine analyses, covering several sizes, for mines located in the 15 most important coal-producing states are given. This is the first time such data have been published by Keystone since 1932. Most of these analyses were made by the U. S. Bureau of Mines and in every case can be accepted as standard for true evaluation of the coals listed. Sources and dates when taken are shown.

A directory of coal sales organizations listed geographically shows main and branch offices of distributors, sales agents and wholesalers. Included are articles telling how to figure combustion, how to burn coal, and how to buy it, extracted in part from an article entitled "Fuels and Combustion," published in the December, 1940, issue of *Power*. The manual comprises 448 pages, 7x10 in.; is cloth bound, and priced at $10.

Lewis Calls Off 4-Day Captive-Mine Strike Pending 15-Day Mediation

WASHINGTON, D. C., Oct. 30—John L. Lewis, president, United Mine Workers, called off the captive mine strike today, accepting an arrangement suggested by President Roosevelt in a letter to William H. Davis, chairman of the National Defense Mediation Board. The plan calls for immediate reopening of the mines, "on the understanding that the Mediation Board will proceed in full session to consider the merits of the dispute and make its final recommendations. It is understood that neither body is committed in advance to acceptance of the final recommendations." The miners' chieftain stated that he had set a new strike deadline for Nov. 15.

The shutdown of coal mines owned by seven steel companies began on Oct. 27 following a message by Mr. Lewis on Oct. 21 to the Mediation Board that the 30-day period for negotiations provided for in the truce of Sept. 19 (*Coal Age*, October, 1941, p. 154) having expired, the U.M.W. gave "formal notice that the temporary agreement expired in toto at midnight Oct. 25."

Informed by Chairman Davis that the board would file no recommendation concerning the union shop issue, about which the dispute revolves, President Roosevelt appealed to the miners' leader on Oct. 24 to keep the mines in operation in order that there would be no interruption to steel output for national defense purposes. The President's plea was supplemented by one by Mr. Davis, who submitted three alternative proposals of the board for an adjustment.

First of these proposals was that both sides submit the dispute to the entire Mediation Board of eleven members, with the agreement that the decision of the board be accepted as final. If an agreement on this basis was not obtained, it was suggested that President Roosevelt ask Mr. Lewis and Myron C. Taylor, former chairman of the board of the United States Steel Corporation, to assume direction of a joint union-management board to negotiate a settlement. The third proposal, to be adopted if neither of the first two was adopted, was that the dispute go to arbitration, with the final decision binding on both parties.

The union leader, in a caustic note, rejected the President's request that arrangements be made for continuance of coal production, stating that in the circumstances he did not feel warranted in recommending an additional extension of the temporary agreement in advance of an opportunity to negotiate with the qualified policy-making executives of the corporations which are resisting acceptance of the standard and governmentally approved agreement of the industry.

Mr. Lewis did, however, accept the suggestion that he confer with Mr. Taylor. The President, in a second note, Oct. 26, asked the U.M.W. chieftain to reconsider his decision refusing to continue production at the mines, stating that, as President of the United States, he was "asking you and your associated officers of the United Mine Workers, as loyal citizens, to come now to the aid of your country."

This appeal also Mr. Lewis stubbornly declined to heed, declaring "there is as yet no question of patriotism or national security involved in this dispute," and blaming delay in Mr. Taylor's meeting him (Mr. Lewis) on domination of the United States Steel Corporation's board of directors by J. P. Morgan, New York banker.

A third letter by the President, on Oct. 27, was short and sharp. It said "Whatever may be the issues between you and Mr. Taylor or you and Mr. Morgan, the larger question of adequate fuel supply is of greater interest and import to the national welfare. There is every reason for the continuance of negotiations. There is no reason for stoppage of work. It is, therefore, essential that the mining of coal should go on without interruption. For the third time your government, through me, asks you and the officers of the United Mine Workers to authorize an immediate resumption of mining." Mr. Lewis ignored this note.

Conferences between Mr. Taylor and Mr. Lewis began at 10 a.m. Oct. 29 at the Mayflower Hotel, and were resumed in the afternoon. At the end of the afternoon session the conferees met with President Roosevelt, and the union leader was prevailed upon to pave the way for resuming production at the mines at the earliest possible time and the Mediation Board was induced to abandon its decision to refuse to make recommendations in the dispute. Mr. Lewis agreed to call the district union leaders together in Washington today to consider the proposal.

At 11:30 a.m. Mr. Lewis, standing beside Mr. Taylor, stated: "I have to announce that the United Mine Workers' conference, on my recommendation, has accepted the arrangement indicated in the President's letter to Mr. Davis. The mines will reopen just as soon as arrangements can be made locally. The night shifts in many instances will reopen tonight."

Mr. Taylor remarked: "I am very gratified at the broad and cooperative attitude which Mr. Lewis has displayed in this situation at a time of great national peril."

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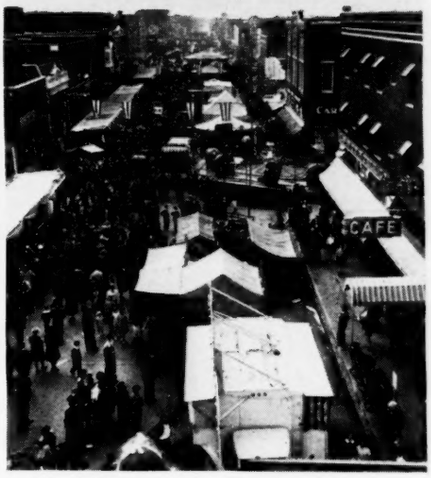
Harlan Operators Sign Closed Shop Pact

Climaxing a 20-year campaign by Harlan County (Ky.) miners for a union shop, William G. Turnblazer, president of District 19, United Mine Workers, announced on Oct. 13 that a contract had been signed with the Harlan County Coal Operators' Association after a week of negotiations.

Under the contract, Mr. Turnblazer explained, the mines will hire new personnel only on the stipulation that the men join the union. Likewise, any non-union men on the payroll prior to the signing of the contract will be required to become union members. The pact will affect about 12,000 miners and 22 mines in the county as well as workings in Bell and Knox counties connected with the Harlan companies. Such matters as paid vacations, seniority rights and general working conditions, as well as provisions governing bonuses and job restoration for miners called and then released from military service, are covered in the contract.

Old King Coal.



Brisk business on the Midway

Verna Wyman, stenographer, and Byron Brown, superintendent, Franklin County Coal Corporation, entertain their visitors. Layton Brown (right), preparation engineer, in a brown study.

Jack Lyons, safety engineer, Bell & Zoller Coal & Mining Co., and crack photographer, faces the camera himself.

D. F. McElhattan, safety engineer, Peabody Coal Co., dreams of new safety gadgets.

Franklin County Pays Tribute To Old King Coal

Featuring Old King Coal and his exploits, West Frankfort, Ill., put on a three-day festival in his honor Oct. 16–18 to make home folk conscious of the importance of the chief industry of Franklin County.

Among the exhibits were tools dating back to the days of hand mining, models of mine locomotives and mining machines, and modern drills, machine parts and shop devices. The State Department of Mines and Minerals exhibit indicated some of the things now done to promote safety and preserve health for the modern miner. Displays of the several coal mining companies of the community, however, proved of greatest interest to coal buyers. On parade was modern coal from dust to lump to meet specifications of home and industry. There also were attractions for the youngsters. High above the crowd sat an inflated image of Old King Coal. Eyeing a 4-ton lump of coal fresh from the inner recesses of Mother Earth, he surveyed the legion that came to do him honor. But he had to take a back seat when William Towers, 79, of Benton, oldest active miner in the county, was crowned Old King Coal. Maxine McGovern, 17, was chosen Queen of Coal, and Virginia Vasso, 24, Christopher, was named Princess Flame.

Roy Adams, superintendent, Old Ben Coal Corporation, reminisces with "Jim" Dunn.

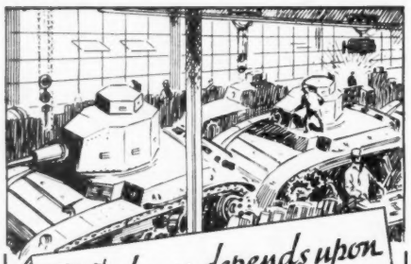
John H. Evans, superintendent, Wasson Coal Co. sees the show with Mrs. Evans.

E. M. (Mack) Elders, superintendent, Peabody Mine 47, visits the show.

Walter Hadfield, hoisting engineer, Franklin County Coal Corporation, takes a day off.

Tom L. Garwood (left), engineer, New Orient mine, tells Fred Miller, vice president in charge of operations, Franklin County Coal Corporation, how it is done.

Speaking of pictures, aerial view of Peabody No. 18.



Defense depends upon PREPARATION

Better preparation is the Anthracite Industry's contribution to defense production. Wilmot Hydrotators now provide a "double defense" at many anthracite preparation plants, as-preparation for the suring improved producer, improved performance for the consumer. Hydrotated anthracite is cleaner coal . . . best for heat, best for power. Wilmot Engineering Co., Hazleton, Pa.

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COAL Preparation UNITS

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BALL BEARING
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CHAIN HOISTS

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Write for Bulletin YC-1 giving complete information, specifications and prices.

COFFING HOIST CO. DANVILLE, ILL.

Industrial Notes

CATERPILLAR TRACTOR CO., Peoria, Ill., has elected Louis B. Neumiller as president. He began his association with the company 26 years ago as a stenographer and blueprint clerk in the engineering department. He succeeds B. C. Heacock, president since 1930, who becomes chairman of the executive committee.

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis., has elected Walter E. Hawkinson, treasurer of the company since 1936, to the joint position of secretary-treasurer. William A. Thompson, vice-president and secretary, resigned recently. The new secretary started with the company 34 years ago in the treasurer's department.

STUART, JAMES & COOKE, INC., have removed their New York office from 17 Battery Place to 52 William St. and have opened a Washington office in the Hibbs Building, 15th St. near H St., where Mr. Stuart will have headquarters.

JOHNS-MANVILLE SALES CORPORATION, New York City, has elected John A. O'Brien to the post of vice president. He will continue his duties as general sales manager of the power products and industrial department.

HERCULES POWDER CO., Wilmington, Del., announces the retirement of C. D. Prickett, vice president and director, who had been with the company since its formation in 1913.

AMERICAN CYANIMID CO. has been appointed sales and technical representative throughout the world of the American Zinc, Lead & Smelting Co. for heavy-media separation (sink-float) processes for beneficiating metallic and non-metallic ores, including anthracite and bituminous coal.

SHAFER BEARING CORPORATION, Chicago, announces that Ray P. Tennes, who for the last seven years has served as a director and secretary-treasurer, has been elected chairman of the board. He succeeds his father, the late M. J. Tennes, who served since 1930. He will continue as treasurer. W. L. Kinnaw, comptroller, has been elected assistant treasurer-assistant secretary.

Coal-Mine Accident Fatality Rate Shows Upward Trend

Accidents at coal mines of the United States caused the deaths of 95 bituminous and 26 anthracite miners in August last, according to reports furnished the U. S. Bureau of Mines by State mine inspectors. With a production of 45,650,000 net tons, the accident death rate among bituminous miners was 2.08 per million tons mined, compared with 2.13 in August, 1940.

The anthracite fatality rate from accidents in August last was 4.96, based on an output of 5,246,000 net tons, against 2.83 in the corresponding month of last year.

For the two industries combined, the accident fatality rate in August last was 2.38, compared with 2.19 in the eighth month of the previous year.

Fatalities during August last, by causes and states, as well as comparable rates for the first eight months of 1940 and 1941, are shown below:

UNITED STATES COAL-MINE FATALITIES IN AUGUST, 1941, BY CAUSES AND STATES

	Underground										
State	Falls of Roof	Falls of Face	Haulage	Gas or Dust Explosions	Explosives	Electricity	Machinery	Other Causes	Total Underground	Surface	Grand total
Alabama	2	1	1	....	....	1	....	....	5	....	5
Arkansas	....	....	....	....	....	1	....	3	4	....	4
Colorado	2	....	....	....	....	....	....	....	2	....	2
Illinois	3	1	....	....	....	1	....	....	5	....	5
Indiana	2	....	....	....	....	....	....	....	2	....	2
Kansas	1	....	....	....	....	....	....	....	1	....	1
Kentucky	7	1	2	....	1	2	....	....	13	1	14
Montana	....	....	....	....	....	....	....	....	....	1	1
Ohio	1	....	1	....	....	....	....	....	2	....	2
Oklahoma	....	....	....	....	....	1	....	....	1	....	1
Penna. (bit.)	5	....	3	....	....	1	1	....	10	1	11
Tennessee	1	....	1	....	....	....	....	....	2	....	2
Utah	1	....	....	....	....	....	....	....	1	....	1
Virginia	5	1	1	....	....	....	....	....	7	....	7
West Virginia	20	....	5	1	1	1	3	....	31	4	35
Wyoming	2	....	....	....	....	....	....	....	2	....	2
Total bituminous	52	4	14	1	2	8	4	3	88	7	95
Pennsylvania (anthracite)	11	1	5	....	3	2	....	2	24	2	26
Grand total	63	5	19	1	5	10	4	5	112	9	121

DEATHS AND FATALITY RATES AT UNITED STATES COAL MINES, BY CAUSES*

	Bituminous				Anthracite				Total			
	Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons		Number Killed		Killed per Million Tons	
Cause	1940	1941	1940	1941	1940	1941	1940	1941	1940	1941	1940	1941
Underground:												
Falls of roof and coal	359	335	1.219	1.066	66	72	1.933	2.007	425	407	1.293	1.162
Haulage	132	112	.448	.356	26	20	.762	.557	158	132	.481	.377
Gas or dust explosions:												
Local	12	14	.041	.044	3	5	.088	.139	15	19	.046	.054
Major	236	42	.801	.134	...	...	.....	.....	236	42	.718	.120
Explosives	17	14	.058	.044	5	11	.146	.307	22	25	.067	.071
Electricity	22	18	.075	.057	5	4	.146	.111	27	22	.082	.063
Machinery	18	21	.061	.067	2	...	.059	.....	20	21	.061	.060
Shaft	4	2	.014	.006	3	2	.088	.056	7	4	.021	.011
Miscellaneous	20	9	.068	.029	3	9	.088	.251	23	18	.070	.051
Stripping or open-cut	7	14	.023	.044	2	2	.059	.056	9	16	.027	.046
Surface	28	26	.095	.083	6	10	.176	.279	34	36	.104	.103
Grand total	855	607	2.903	1.931	121	135	3.545	3.763	976	742	2.970	2.119

* All figures subject to revision.

GOULD STORAGE BATTERY CORPORATION, Depew, N. Y., has opened a new office at 430 Frick Building, Pittsburgh, Pa. In charge will be S. E. Gane, who has represented the company in the Pennsylvania, southern Illinois and Kentucky coal fields for the last eight years. He will be assisted by E. J. Boyle, who was for some time representative for the General Electric Co. before joining the Gould organization.

PROTECTIVE COATINGS, INC., Detroit, Mich., has been established to manufacture the Tocol line, including complete rubber insulation and products for protection of building structures, metals used in production and for the protection of many types of materials against the ravages of the elements, acids, alkalis and general wear.

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Trade Literature

PORTABLE BELT CONVEYORS AND BUCKET LOADERS—Jeffrey Mfg. Co., Columbus, Ohio. Catalog 758 points out features and advantages of portable belt conveyors. Catalog 759 is devoted to portable bucket loaders.

Electric Equipment

AIR-COOLED TRANSFORMERS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Booklet B-2304 gives answers to typical questions about advantages, safety features, design and tests on air-cooled transformers, 150 to 2,000 kva., for factories, mines and central stations.

CAPACITORS — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Descriptive Data 49-165 describes capacities with ratings from 2½ to 180 kva., 230 to 4,160 volts, for outdoor mounting on poles or cross arms. Application, distinctive features and construction details are discussed.

CLUTCHES—Stearns Magnetic Mfg. Co., Milwaukee, Wis. Bulletin 225-A includes engineering data on the application of magnetic friction devices, with dimension drawings, tables of specifications and pictures of installations showing adaptability of magnetic clutches and clutch-brake units for near or remote control in industrial use.

DISTRIBUTION SYSTEMS — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Book B-2306, covering everything from substations and switchgear to small auxiliary equipment, describes radial and secondary network distribution systems, including radial systems, banked transformer system, plant network systems and associated electrical apparatus.

ELECTRICAL CATECHISM—Fairbanks, Morse & Co., Chicago. Bulletin E100C explains electricity and magnetism as utilized in electric generators and motors, discusses important electrical measurements, presents the principles of d.c. generators and motors, and gives an A-B-C examination of alternators and a.c. motors.

MATERIALS HANDLING — Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Booklet B-2264 describes electric motors and controls for cranes, hoists and gantry bridges. Features discussed are a.c. and d.c. motors up to 600 hp. for typical materials handling operations; controllers, protective devices and methods of motor braking, with a note on gear motor applications.

TRANSFORMERS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Bulletin B-2287 covers distribution transformers up to 500 kva. made of Hypersil, a newly developed silicon steel said to give better regulation, increased flux and reduced size and weight.

VOLTAGE RELAYS—Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Catalog Section 41-291 discusses construction and operation of relays to protect 115- to 460-volt, 60-cycle circuits or apparatus against voltage changes of any predetermined value.

Maintenance

ARC-WELDING COSTS—Air Reduction, New York City. Booklet shows how to estimate the cost of arc-welding electrodes, with consumption figures for both bare and shielded arc electrodes on all metal thicknesses commonly employed in making fillet welds, square-groove butt joints, V and U groove butt joints, bevel grooves and J grooves.

BELT VULCANIZER—B. F. Goodrich Co., Akron, Ohio. Catalog Section 2159 describes the Type RO portable vulcanizer and application to speedy repair of minor cuts and gouges in a belt's rubber cover.

WELDING PRODUCTS — American Manganese Steel Division of American Brake Shoe & Foundry Co., Chicago Heights, Ill. Bulletin 941-W describes Amsco welding products for reclamation, hard surfacing and repair of ferrous equipment parts.

Mechanical Mining

UNDERGROUND BELT CONVEYORS—Goodman Mfg. Co., Chicago. Bulletin C-411 describes complete line of sectional belt conveyors for gathering and transporting coal —entry, room or face—designed to meet every underground condition and capacity requirement.

Miscellaneous

BEARINGS—Federal-Mogul Corporation, Detroit, Mich. A new Handbook of Sleeve Bearings, by Albert B. Willi, discusses effect of design, alloys and manufacturing methods on sleeve-bearing efficiency and defines the field of application for each basic type.

LUBRICATION—Farval Corporation, Cleveland, Ohio. Bulletin Form 167 describes in minute detail the Farval centralized system of lubrication, stressing its simplicity, illustrating its component parts, and charting savings.

SYNTHETIC RUBBER—B. F. Goodrich Co., Akron, Ohio. Catalog Section 8000 discusses in detail the properties of Ameripol D, including hardness, tensile strength, elongation, weight, color, odor and taste, elasticity and permanent set, tear and abrasion resistance, and resistance to flexing, oils and heat.

WIRE ROPE—Broderick & Bascom Rope Co., St. Louis, Mo. Booklet is devoted to wire ropes used in mining, with specific recommendations as to grades and construction of rope best suited for various types of equipment.

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WIRE ROPE—R. G. LeTourneau, Inc., Peoria, Ill. Bulletin Form G1047 describes features and advantages of preformed stress-free Tournarope, made especially for use with cable-operated, tractor-drawn equipment.

WIRE ROPE—Macwhyte Co., Kenosha, Wis. Bulletin 573-C tells how to save money by selecting the correct wire rope for given equipment, keeping in mind bending fatigue, abrasive wear and loading stress.

Power Transmission

HYDRAULIC DRIVES—Twin Disc Clutch Co., Racine, Wis. Bulletin 132 discusses the nature of hydraulic drives, design and performance of hydraulic clutches and hydraulic torque converters, and applications of hydraulic clutches and hydraulic torque converters.

SHEAVES—Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin B-6047 presents full descriptions of Texsteel and Texdrive sheaves, steel and cast-iron units for Texrope drives from fractional to 25 hp. Duro-Brace Texsteel sheave is one of the lightest heavy-duty sheaves on the market; True-Groove Texdrive units are designed for rigidity against shocks and to provide a smooth, vibrationless flow of power.

SPEED REDUCERS—Cleveland Worm & Gear Co., Cleveland, Ohio. Bulletin Form 150 cites reports describing graphically the long-range, economical operation of its worm gear reducers.

VARIABLE SPEED TRANSMISSION—Link-Belt Co., Philadelphia, Pa. Catalog 1874, on the P. I. V. variable speed transmission, tabulates, illustrates and describes units of ½- to 15-hp. capacity, with speed ratios up to 6 to 1. Speeds, torque ratings, dimensions, weights and other data are given.

V-BELT DRIVES—Thermoid Rubber Division of Thermoid Co., Trenton, N. J. Form 3726 gives complete data on V-belts, sheaves and pulleys in selecting standard drives and calculating special drives.

Preparation

SCREEN CLOTH—Robins Conveying Belt Co., Passaic, N. J. Bulletin 113 cites salient qualities of Robins woven-wire screen cloth, stressing toughness, hardness, elasticity and stiffness.

Pumps

MINE PUMPS AND ACCESSORIES—Deming Co., Salem, Ohio. Bulletin 1000 describes the salient features of Deming mine pumps and accessories, giving performance tables.

Stripping

EARTH MOVERS—Baker Mfg. Co., Springfield, Ill. Bulletin 834 explains operations and benefits said to accrue from use of the company's bulldozers and gradebuilders with their direct hydraulic lift and down pressure.

EXCAVATOR—Link-Belt Speeder Corporation, Chicago. Folder 1914 describes Model LS-50 ½-yd. crawler shovel-dragline-crane, with the non-clogging crawler treads; alloy-steel all-welded lower frame and simplified design of the upper machinery.

WHAT'S NEW IN COAL-MINING EQUIPMENT

NOISE REDUCERS, RESPIRATOR

To decrease the effect of noise upon workers, the Mine Safety Appliances Co., Pittsburgh, Pa., offers M.S.A. ear defenders, which are said to reduce loud noises by 35 to 45 decibels, or to about one-tenth their former loudness, yet are so designed that warning signals and conversation can be heard easily.

Essentially, each M.S.A. ear defender is a tapered tube molded from surgical-type soft rubber, consisting of two barriers, an outer one of metal and an inner one of soft rubber separated by an air space. Ear defenders can be cleaned easily with soap and water.

The new and improved single-filter Dustfoe respirator also is announced by M.S.A. Featured improvement is the new single filter, which replaces the two-part (felt screen and cellulose) filters used previously. It is all in one piece, giving U. S. Bureau of Mines-approved protection against an even broader range of dusts and mists, states the manufacturer. The filter is more porous on the outer side so that the larger dust particles are filtered out first, thus preventing rapid build-up of breathing resistance through clogging of filter.

•

SELF-ALIGNING IDLER FOR FLAT CONVEYOR BELTS

A swiveling, positive, self-aligning idler for automatically correcting misalignment of either carrying or return runs of non-reversing conveyor belts supported on flat-roll idlers is offered by Link-Belt Co., Indianapolis, Ind. It has a centrally pivoted cross member which, besides being equipped with a flat idler roll for supporting the belt, has a vertically mounted actuating roll at each end for lightly contacting the edge of the belt when its lateral misalignment exceeds a predetermined amount.

As but a slight pressure of the belt edge against actuating roll serves to swivel the idler unit on its pivot sufficiently to guide the belt automatically and quickly back to proper alignment, possibility of injury to belt edge is said to be avoided. When used on return runs, one idler should be placed close to tail or take-up shaft so that belt will be guided centrally on pulley, and one at every 10 or 15 idler spaces. On the carrying run, one idler should be placed just beyond the loading chute and one at every 10 or 15 spaces thereafter.

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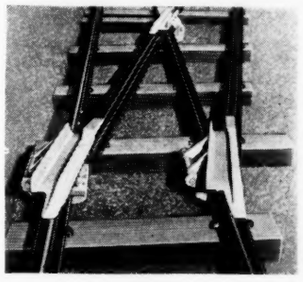
JUMP-OVER SWITCH

A device for providing temporary jump-over switches in main haulageways is offered by the Portable Lamp & Equipment Co., Pittsburgh, Pa. When the device is employed, man-hours ordinarily necessary for installing a



switch are often cut more than a half, as it is unnecessary to cut main track.

Designated a switch connector, the equipment consists of two turnout castings and a frog casting, all of which are hinged to base members which in turn are bolted to rails, so that the different units may be hinged on or off the rails as required. Two combinations of units are available, corresponding to a conventional switch with No. 2 and No. 4 frogs. Base members are easily attached to rails by means of standard track bolts.

•

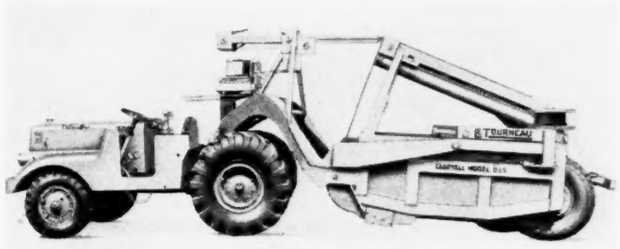
SCRAPER, WIRE ROPE, WELDING ROD

R. G. LeTourneau, Inc., Peoria, Ill., announces the Model DLS Carryall scraper, with a rated capacity of 8½ cu. yd. struck and 11 yd. heaped, for use with the new Caterpillar four-wheel tractor. The Model DLS is very similar to the Model LS; it has the same steep, long blade base, which causes material to boil in and flow back into the bowl and forward into the apron; also the same high sides and built-up apron. Chief changes are in the yoke for mounting on the pulling tractor and the position of the power control unit.

Cutting edge is 8½ ft. With the apron cable dead-ended on apron, all hoist and unloading cables are now placed up and out of dirt, eliminating abrasive cable wear. The DLS is operated by cable from a standard LeTourneau power control unit specially adapted for use with the new caterpillar wheel tractor.

Tournarope, a 6x9 filler-wire right-lay wire rope with an independent wire-rope center and an identifying galvanized core strand is being manufactured by LeTourneau especially for cable-operated, tractor-drawn equipment. It is made of 199 fine steel wires each bathed in oil as it goes into the strand die, and it comes in the following sizes: ⅜, ½ 9/16, ⅝, ¾ and ⅞-in.

Tournaweld, developed and manufactured expressly for the various welding apolications used in the manufacture of LeTourneau equipment, is now available for general maintenance work. It is available in the following sizes: 1/16-, 5/32-, ¼-, 7/32-, 9/16-, 5/32- and ⅛-in.



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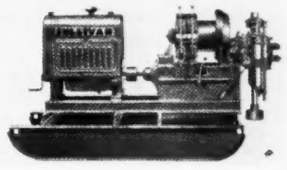
CORE DRILL

A new heavy-duty core drill, the No. 22-HD, is offered by the Sullivan Machinery Co., Michigan City, Ind. It is adaptable for coal prospecting or testing foundations for heavy construction, being built for surface drilling under the toughest of operating conditions; conservatively rated at 1,750 ft. capacity with "E" rods.

It is a direct-drive machine with power unit connected by a clutch to the drilling head through the four-speed automo-

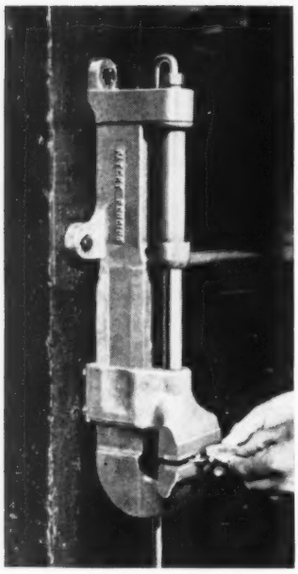


tive type transmission. The built-in clutch allows the use of any power unit having a stub shaft (electric, gasoline or diesel) if operating characteristics are suitable. Controls are conveniently grouped, all gears are inclosed, and a hand-lever safety clutch permits the runner to stop rotation of the beveled drive gear when the swivelhead is open while running or pulling rods. Swivelhead, large hoisting drum, transmission, clutch and power unit are mounted on rigid skid base.

•

HYDRAULIC VISE

A new hydraulic vise, designed to offer savings in time and labor, has been introduced by the Studebaker Machine Co., Chicago. Capable of developing pressure up to 5 tons, this unit is said to speed up small press and cutting operations as well as ordinary vise work. It is operated entirely by foot control, permitting the use of both hands in



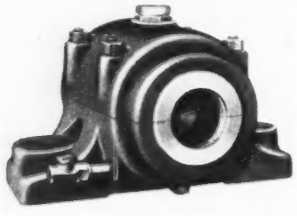
setting up and removing work. The unit is self-sufficient—no outside power is needed.

Stepping on one pedal moves the vise jaw to contact against the work; a second pedal applies pressure; a third pedal releases the jaw. Because the operator can use both hands, exceptionally heavy work can be handled easily and with precision. The vise mounts horizontally on any type of bench as well as vertically on wall or post. Two sizes are available: 5 and 7 in. width between jaws.

•

PILLOW BLOCKS

New Sleevoil precision pillow blocks in plain and water-cooled types with shaft sizes from $\frac{7}{16}$- to 8-in. inclusive, designed for a wide range of industrial applications where a high-grade babbitted bearing is required, are offered by Dodge Mfg. Corporation, Mishakawa, Ind. These bearings



are fully self-aligning and can be furnished in either expansion or non-expansion types. Expansion pillow blocks have no provision for thrust loads but the non-expansion bearings are supplied with two internal split thrust collars. This type should be used as an anchor bearing and other bearings on the same shaft should be of the expansion type.

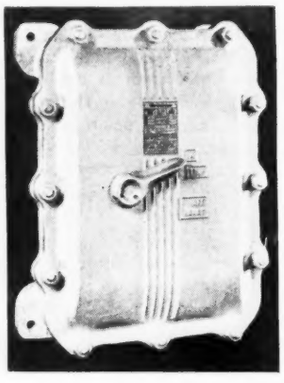
Effective sealing against admission of dirt of escape of lubricant is provided by special seals held onto the shaft by garter springs so that they revolve with the shaft and give the effect of piston-ring seals. A drain is provided at the bottom of the seal grooves to return oil to oil chamber.

Sleevoil water-cooled pillow blocks are identical in design and construction with the plain type except for the water-cooled feature, which makes them particularly adaptable for service under elevated temperatures, heavy loads or rubbing speeds.

•

CIRCUIT INTERRUPTER, MOTOR

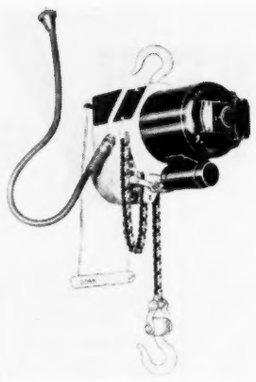
For disconnecting or interrupting a.c. and d.c. circuits in Class 1 Group D locations where atmospheres contain explosive vapors, a new non-automatic circuit interrupter is announced by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Manually operated, the interrupter is furnished with an NEMA Type 7 cast inclosure finished in aluminum with a closely ground fit



between box and cover. Resistance to explosive pressures of hazardous atmospheres is assured by heavy walls and strong fastenings.

Designed for 250 to 66 volts on a.c. circuits and 125 to 250 volts on d.c. circuits, units are rated from 50 to 600 amp., depending on frame sizes. Interrupting capacity is 5,000 to 10,000 amp. Contact burning is reduced to a minimum by De-ion arc quenchers which divide and extinguish arcs almost instantly.

For use on cranes, hoists, lathes and many other industrial units where instantaneous reversing is necessary, a new capacitor-start reversing motor is announced by Westinghouse. Available in ratings from $\frac{1}{6}$ to $\frac{3}{4}$ hp., single-phase, 60-cycle, the motor operates at 1,725 r.p.m. on 115- and 230-volt circuits. To reduce maintenance, no brushes or commutators are used. Reversing the motor requires a special centrifugal-starting switch with two contacts, a solenoid relay and a resistor, all of which are furnished as a part of the motor. A drum switch must be provided separately to operate the motor.



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HIGH-INTENSITY MAGNET

Dings Magnetic Separator Co., Milwaukee, Wis., announces that its high-intensity double-gap rectangular suspended magnet, although developed only a few years ago, has had its attractive force increased about 25 per cent. According to the company, these units have found wide use in the coal industry to protect crushers and pulverizers against tramp iron, which if it strikes metal objects may cause sparks and hence dust explosions.

•

SHOVEL-DRAGLINE-CRANE

A combination shovel, dragline and crane, Lima Type 603, is offered by the Lima Locomotive Works, Inc., Lima, Ohio. When used as a shovel it is equipped with 21-ft. boom, 17-ft. dipper handle and $1\frac{1}{2}$-yd. dipper. As crane it has a maximum lifting capacity of 25 tons. Dragline capacity is variable, depending on nature of work. Shovel boom and dipper handle are of box-type design, electrically welded throughout.

Available with either gas, diesel, oil or electric power unit, Type 603 is equipped with inside expanding clutches with housing

cooled through radiation fins. Clutches and brakes have extra large diameter. Each major operation is independent of the other, making it possible to hoist, travel, swing and raise or lower boom simultaneously. Helical cut gears are used throughout to assure quiet, smooth operation, and, for further efficiency, every vital bearing point has roller bearings. Length of crawlers can be extended to increase ground bearing area; change from short to long crawlers can be made without dismantling machine.

•

GRINDING-WHEEL DRESSER, LOW-VOLT TRANSFORMER

Ideal Commutator Dresser Co., Sycamore, Ill., announces a new abrasive-wheel-type grinding-wheel dresser, said to give a cutting and truing effect almost equal to that of a diamond. The

cutting wheel, with a conveniently large handle, is held in a protective metal housing which deflects its grindings from the operator. When necessary, the wheel can be replaced.

Besides general cleaning and truing grinding wheels, the wheel will true cut-up and uneven sides, dress deep grooves and out-of-roundness and restore the balance of wheels needing such correction. It also can be used to shape wheels into different forms when form grinding is desired.

Ideal also offers a new safety device for workmen using elec-

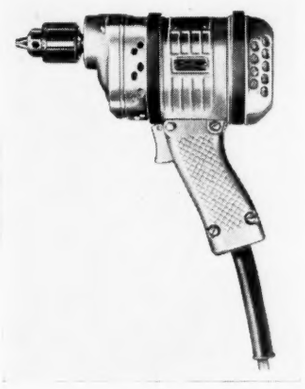
trical extensions in damp, all-metal or otherwise hazardous locations. It is composed of a step-

down transformer, easily plugged in between power supply and extension to reduce extension voltage to a harmless 6 volts. Thus danger from shock caused by bad sockets or defective extension cords is eliminated.

•

HIGH-POWER DRILLS

Extremely light in weight and developing high power are the U14FS series ¼-in. "Aircraft" drills offered by the Independent Pneumatic Tool Co., Chicago. Particularly useful for operation in limited space or in unusually difficult positions, these drills are designed with the power reserve and construction ruggedness necessary for high-speed production.



Of small size and compact design, they are available in three different speeds and have side-switch-style handle for either continuous or intermittent drilling.

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LIQUID LEVEL CONTROL

Photoswitch, Inc., Cambridge, Mass., offers level control Series P16, which provides on-and-off valve or pump control of any liquid. Complete equipment is available for single-level indication and control, on-and-off pump-up and pump-down control at two levels, boiler feed-water control and low-level safeguards. Probe fittings have been designed for high- and low-pressure and temperature requirements as well as for sanitary installations.

Probes or electrodes are attached to the tank at levels representing the low point where pumping starts and the high level where pumping stops. These probes are wired to Photoswitch level control. When the liquid level falls below the lower probe, the level control starts the pump and the tank fills. When the level rises to the upper probe, the fluid itself acts as a conductor of the small current required for the operation of level control which stops the pump. Even when used with non-conductive fluids, the probe circuit carries only milliamperes of current and low voltage. As Series P16 controls do not involve mechanical float or pressure switches, they are easily installed and are said to be maintenance-free.

•

SYNTHETIC SPONGE RUBBER

To fill requirements of a wide range of applications where oil, grease or other solvents which deteriorate natural rubber rapidly are present, B. F. Goodrich Co., Akron, Ohio, offer a new sponge rubber made from its synthetic rubber, Ameripol. Exhaustive tests are said to have proved that Ameripol has unusual resistance to oils, greases and many other solvents, and will also endure a higher temperature than natural rubber. The new synthetic sponge rubber is similar to the milled sponge made from natural rubber. Sodium bicarbonate or a similar blowing agent is turned into gas by heat of vulcanization to produce a cellular structure.

•

FIRST-AID DEVICE

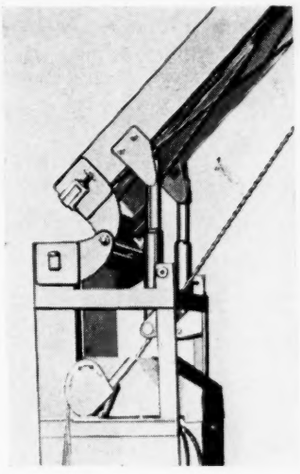
A new model, streamlined, compact Super Sight is offered by the Boyer Campbell Co., Detroit, Mich. The new bracket also has been adapted to the larger model, which was introduced a

year ago for first-aid work. Both models give magnification and light where wanted, providing magnifying lens and light in a single unit. They are moved about with finger-tip control, remaining where placed. Either model comes in a choice of two-bracket applications, one that may be attached to the arm of a chair or table and the other mounted on a pedestal.

•

SPRING BALANCED SECTION FOR PORTABLE ELEVATOR

Lewis-Shepard Co., Watertown, Mass., has made available for general industry a special spring balance device for easing the raising and lowering of the hinged section of portable elevators where fairly frequent hinging operations are necessary.

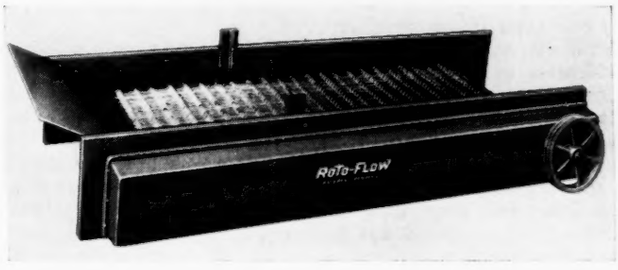


Powerful compression springs within the cylinders balance the weight of the upper frame, enabling one man to raise and lower the frame quickly. This spring balance will balance hinged sections 8 ft. long or sometimes longer.

•

SCREEN

Roto-Flow Screen Co., Milwaukee, Wis., offers the Roto-Flow screen, embodying a new principle which eliminates screen cloth. Its self-cleaning deck is said to assure full-sized openings at all times—even with moist slack. A roll-over feature is included to speed screening, and a 2x5-ft. unit is designed to handle the same capacity as a 3x8-ft. conventional screen. The maker says there is no degradation with this screen, as elimination of bouncing, jostling and cascading reduces breakage to a minimum.



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PILOTED COUPLING

Falk Corporation, Milwaukee, Wis., has added a new coupling to its Steelflex line with the Type P piloted unit for floating-shaft requirements. It is especially adaptable for use on horizontal and vertical pumps and exhaust draft fans. Combining a resiliency and shock-cushioning section with a low-angle universal-joint action it makes unnecessary an outboard bearing on extended shafts or auxiliary bearings on intermediate shafts, saving thereby installation cost, space and foundation for auxiliary bearings.

The piloted coupling consists of two hubs, one of which carries an integral flange to which the cover is secured, a special tempered steel member forming a complete cylindrical grid member and a flanged steel cover secured to the hub flange with cap-screws. Three types are available: single-piloted, double-piloted horizontal, and double-piloted vertical.

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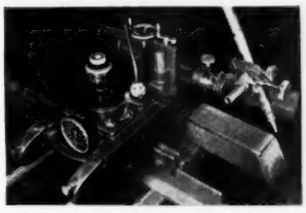
TORCH HOLDER

Extra convenience and accuracy in setting Radiagraph cutting torches for any desired angle of cut is claimed for the new Protractor type torch holder just



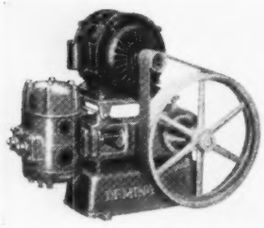
introduced by Air Reduction, New York City. As an example of the type of work for which the accuracy and time-saving features of the new holder are said to be particularly valuable, a bevel-cut billet is shown in the illustration. A circular knurled knob permits angular adjustment, as shown on the scale. Having a 90-deg.-angle range, the new holder can be attached to any standard Airco Radiagraph.

•

DUPLEX MINE PUMP

Deming Co., Salem, Ohio, offers a duplex double-acting piston pump with overlapping pis-

ton travel, for use in mines where acid conditions are not extreme. It is designed for use where vertical distance to lowest water level does not exceed 25 ft. and



total head does not exceed 230 ft.

Power end consists of a heavy casting which includes the base and oil reservoir. The water end, which is bolted to the power frame, is fitted with renewable cast bronze cylinder liners. Suction and discharge openings on both sides permit piping to be taken from either side.

The crankshaft is drop-forged and counterbalanced with cranks set at 90 deg., with Timken roller bearings at both ends. Pistons of the unit type, packed with hydraulic packing rings, can be adjusted for wear and easily removed from back end of cylinder.

•

FUSED TROLLEY TAP FOR SMALL AMPERAGE

A new fused trolley tap for the protection of small motors and their trailing cables has been developed by Ohio Brass Co., Mansfield, Ohio. Known as the Form 5 junior double-cable end tap, it can be placed at any point in a trailing cable. It is designed to handle currents from 3 to 30 amp. in the voltage range from 250 to 600 d.c. (fuses 13/16x5 in. are available in these amperages). The case of this tap is fabricated of one-piece Bakelite canvas tubing lined with asbestos to pre-

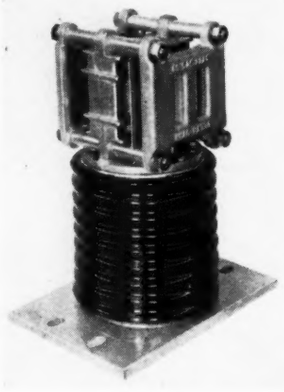
vent burning when the fuse blows, giving complete protection to the operator at all times.

•

INDOOR BUS SUPPORT

A new heavy-duty 23 kv. Class C-7 bus support for holding two groups of 2¼x4-in. bars with wide center spaces to afford better current distribution is offered by Delta Star Electric Co., Chicago. Conductor fitting is equipped with non-ferrous rollers on each side of the bar groups, permitting movement of conductors without unduly stressing porcelain.

Spring bronze spacers between bars prevent chattering and pipe spacers between outside clamps and center castings limit pressures on spring spacers to a pre-



determined value. Cantilever stresses are transmitted directly to porcelain through the center casting. The support is made for ratings up to 34.5 kv. and any size or number of bars.

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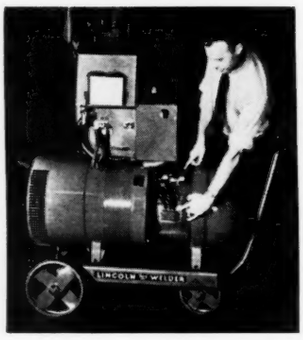
PROTECTIVE CONTROL FOR WELDERS

Complete protection against heat or excessive current, or both, is provided by a new protective control device for arc-welding machines offered by the Lincoln Electric Co., Cleveland, Ohio. The device consists of two current transformers, the primaries of which are connected in series with the motor leads and the secondaries supplying power to operate two snap-action thermostats which are mounted directly on the motor lamination. These thermostats are connected to the lamination in such a way that they operate by means of heat conduction as well as by current passing through the thermostat.

The thermostats automatically reset when the motor returns to safe operating temperature or when current is reduced, and no manual operation is required to



start the machine, except pushing the start button. A special circuit allows the starter button to be held "in" after the welder thermostats have been tripped. This allows the machine to rotate with no load and the welder ventilation aids in the cooling of welder after trouble has been rectified.

•

LIGHTWEIGHT SWEATBAND

A new lightweight absorbent sweatband made of synthetic sponge is announced by the American Optical Co., Southbridge, Mass. The sponge, which is 7½ in. long, covers a generous width of brow. Not only does it keep sweat out of eyes and off goggles but it can be ster-

ilized and used again and again. As time studies at a certain plant showed that some workers spent 42 minutes per man per day mopping goggles and foreheads, the manufacturer asserts that this unit eliminates much waste of time.

•

DUAL POWER PUMP DRIVES

Uninterrupted water supply 24 hours a day from deepwell turbine pumps is provided by dual drives, according to the Peerless Pump Co., Los Angeles, Calif. Normally equipped with electric motor head, the secondary drive may be by right-angle gear, powered by gas, gasoline or diesel engine or steam turbine. In the event of interruption of electric service, the standby plant can be started instantly, either by the operator or by completely automatic control, thus providing a never-failing source of supply.

Other types of dual-drive pumps have steam turbines as primary power, with internal combustion engines connected with the secondary right-angle gear. Either source of power operates independently of the other.

•

IMPROVED CONTROLS FOR TRACTORS

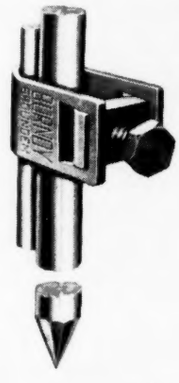
Buckeye Traction Ditcher Co., Findlay, Ohio, announces an improvement in the design of the central levers and linkage on its Model HD (heavy-duty) power control units for Allis-Chalmers, Cletrac and Caterpillar tractors. The change incorporates relocated horizontal control levers which are placed within easier reach of the operator.

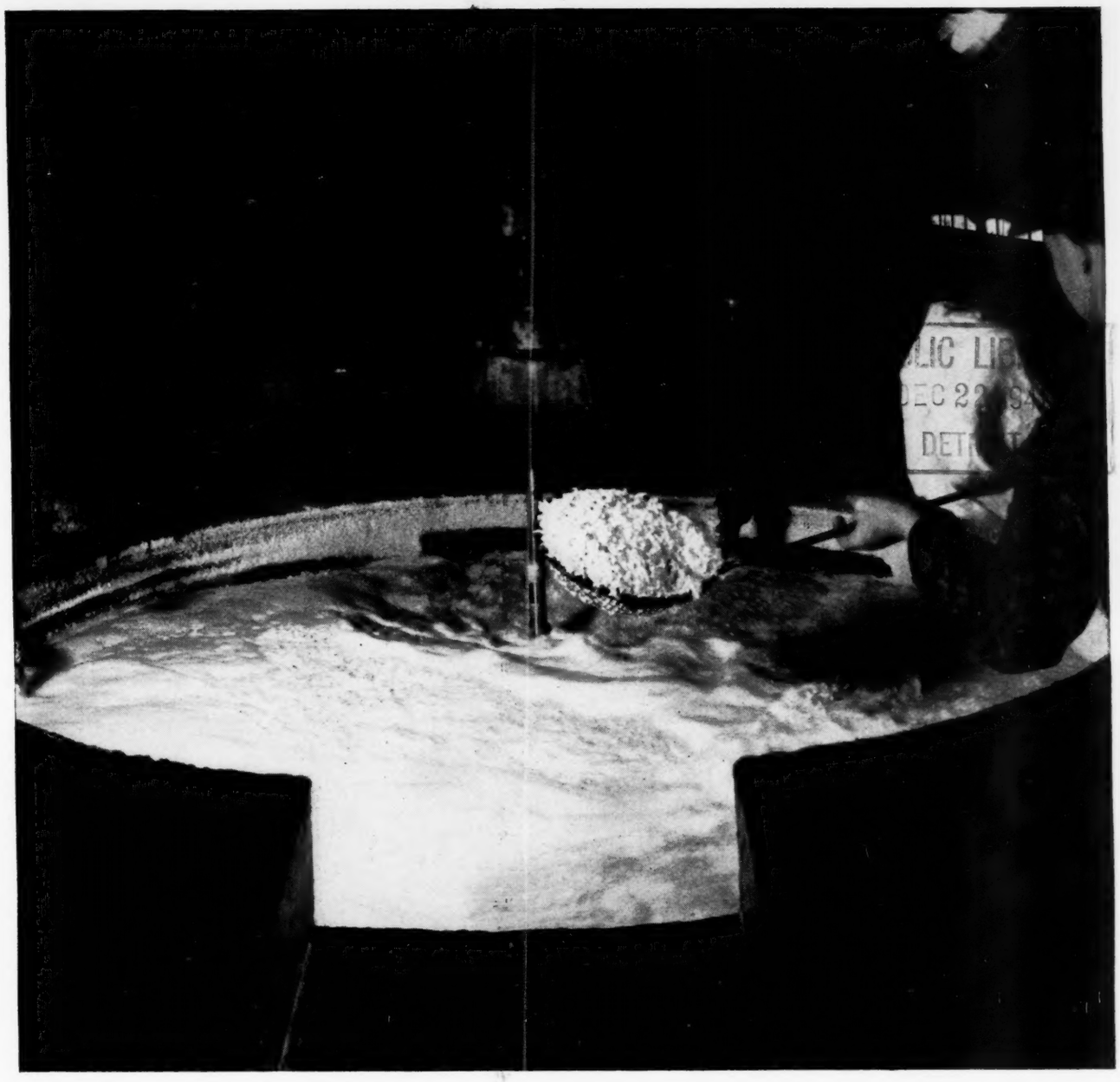
Better leverage is now obtained and operation is simpler and more positive. The fair lead swivel sheaves have been lowered, thus bringing the direct-line pull closer to the tractor drawbar, resulting in better tractor balance. Complete control lever and linkage assemblies are interchangeable with older style mechanisms and are available for replacing them.

•

GROUND CONNECTOR

Burndy Engineering Co., Inc., New York City, offers the Type GH ground connector, an economical ground clamp for driven rod or pipe. It can be slipped over the top of the rod as a one-piece assembly or from the side when the head of the pipe or rod has been mushroomed from driving. It is available in ½- to 1-in. sizes for rod and ¼- to ¾-in. i.p.s. for pipe.





Soap suds that turn into rubber

A typical example of Goodrich product development

IN THE PICTURE a mixture of soapy water with some 3000 gallons of chemicals taken mostly from crude oil has just been stirred up like a 3000-gallon glass of malted milk. Lift out some of the soap suds and it looks like cottage cheese. Roll some into a ball, and it feels and acts and stretches like rubber.

Ameripol, the B. F. Goodrich rubber that never saw a rubber tree, is not just a substitute. It does things ordinary rubber won't do. Stands oil and gasoline, for example. When oil soaks into it, rubber swells and loses its strength. Hose to fill your car with gas used to be made with heavy linings of interlocking metal parts. Miles of tank - loading and ship - loading hose had to be replaced every year. Now hose of Ameripol handles oil or gasoline as easily as water.

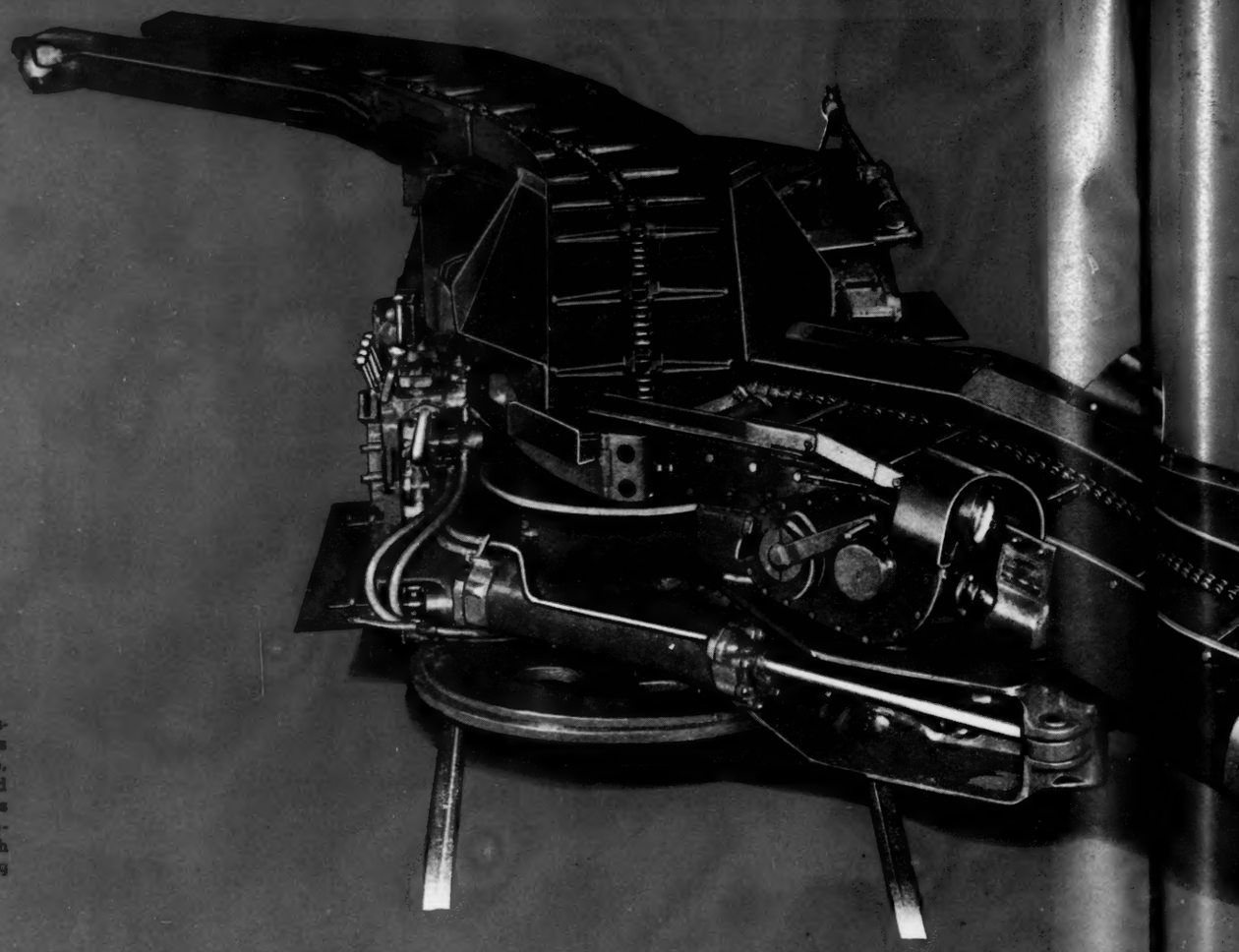
Ameripol is also one of many safeguards for America's defense, a source of supply in case shipments of crude rubber should be cut off. And it's being actually used in bullet-sealing gasoline tanks and many other defense products. After defense needs are met hundreds of new products will be made from it.

Developments like this are all in the day's work at Goodrich — but no more so than the yearly improvements in V-belts, hose, conveyor belts, and hundreds of other products of rubber used in industry. Ask your Goodrich distributor about Goodrich improvements in any product you use. *The B. F. Goodrich Company, Mechanical Goods Division, Akron, Ohio.*

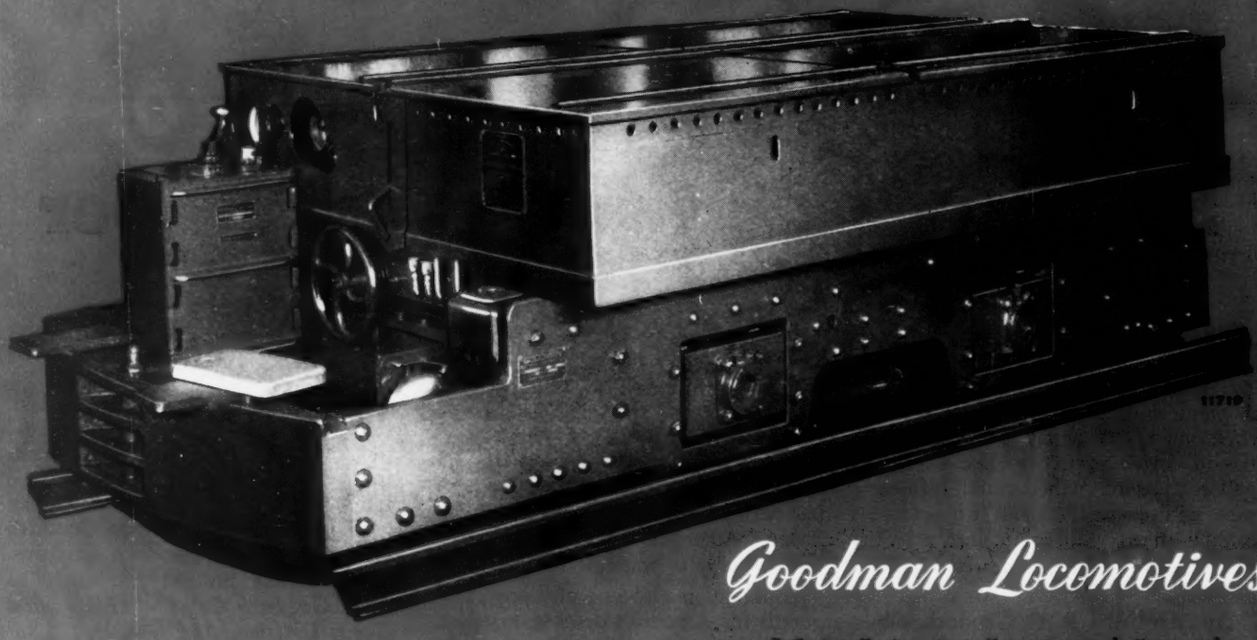
B.F. Goodrich

First IN RUBBER

Another story of Goodrich development work appears on page 97.



Industry and transport, vital factors in National Defense, demand COAL and METALS. Thousands of tons are produced daily with Goodman mining machinery.



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Goodman Locomotives

Built in all sizes in trolley, storage battery and combination types, each locomotive is a specialized job to suit definite mine requirements.

GOODMAN MANUFACTURING COMPANY

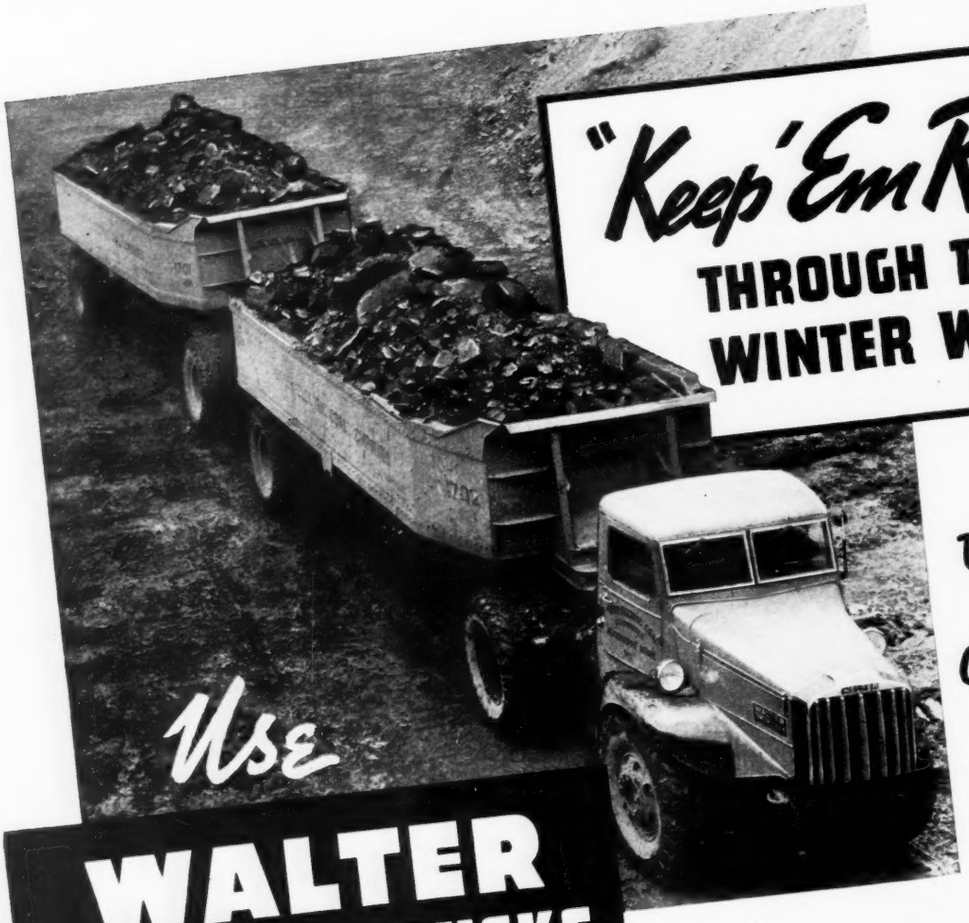
SPEED • TONNAGE • LOW COST

Goodman Track Mounted Loaders

These powerful, easily controlled, high capacity machines load out, not only from straight track but on sharp curves and in close posting, with a dispatch that consistently limits operating delays and assures maximum tonnage. Tight enclosures protect all working parts from dirt.

Without obligation, consult a Goodman engineer for details of our complete line of modern, mechanized mine equipment.

HALSTED STREET AT 48TH • CHICAGO, ILLINOIS



"Keep 'Em Rolling" THROUGH TOUGHEST WINTER WEATHER!

Don't let Snow, Ice or Mud Cut your Tonnage

Use

WALTER TRACTOR TRUCKS

with

4-POINT POSITIVE DRIVE

At its best, strip mine hauling is a test for any truck. But in Winter, when running gets really tough, you more than ever need the unfailing 4-Point Positive Drive of WALTER TRACTOR TRUCKS to keep your coal moving, regardless of weather and road conditions. Walter Tractor Trucks give you not two, but FOUR powerful driving wheels, with 100% traction in each. On snow, ice or mud, the wheels having the most traction always get the most torque, providing constantly available power. This rugged power-plus-traction of Walter Tractor Trucks is hauling loads up to 55 tons (shown above), making more trips per day, cutting costs for many leading strip coal mines. Write for detailed literature.

- AUTOMATIC LOCK DIFFERENTIALS proportion the torque to each wheel according to its requirements at any instant.
- SUSPENDED DOUBLE REDUCTION DRIVE reduces unsprung weight, gives higher ground clearance, saves wear and tear on truck and tires.
- SCIENTIFICALLY CORRECT WEIGHT DISTRIBUTION with balanced cab forward, short wheelbase, low chassis height.
- 14 TO 1 RANGE TRANSMISSION with 6 speeds forward, 2 reverse, fast high gear, powerful low gear and proper intermediate ratios for all operating conditions. Single lever control.

WALTER MOTOR TRUCK CO.

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